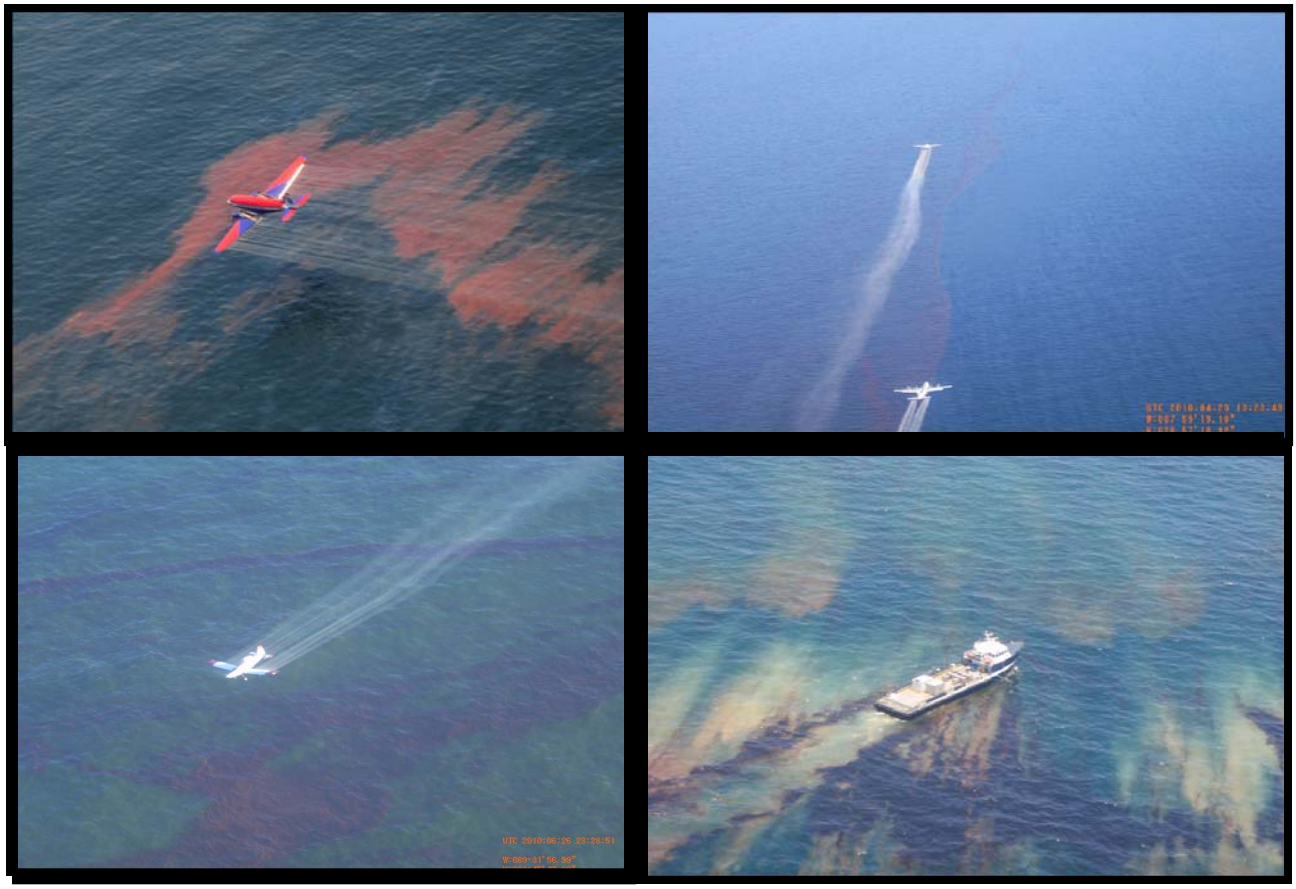
AFTER ACTION REPORT

DEEPWATER HORIZON MC252
AERIAL DISPERSANT RESPONSE



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1. INTRODUCTION

This report is submitted to meet the requirements of the Regional Response Team 6 (RRT 6) for the use of dispersants in accordance with FOSC Dispersant Pre-Approval Guidelines and Checklist version 4.0 dated January 24, 2001, and to meet the post-incident report requirements of RRT 4 document titled "Use of Dispersants in Region 4" dated 8 October 1996.

This report summarizes only the Houma ICP Aerial Dispersant Group operations and does not report on deep sea injection of dispersants or the effect of dispersants on controlling volatile organic compound (VOC) emissions near the source.

A summary of the aerial dispersant operations conducted during the DWH MC252 response is provided below:

AERIAL DISPERSANT GROUP
OPERATIONAL SUMMARY

- **Approximately 12-18,000,000 gallons of oil dispersed***
- **Approximately 973,000 gallons of dispersant applied**
- **Aerial Dispersant Team of approximately 300 members participated in the response**
- **90 days of dispersant operations**
- **61 days of spray operations**
- **20 aircraft (12 spray aircraft, 8 spotters)**
- **412 spray sorties**
- **816 reconnaissance and spotter sorties**
- **305 square miles sprayed over an 18,000 square mile operating area**
- **100,000 gallon per day spray capability developed which could disperse tens of thousands bbls of oil per day**

***The range of oil dispersed is based on a Dispersant to Oil Ratio of 1:20 and a range of 60-90% effectiveness.**

2. LESSONS LEARNED AND RECOMMENDATIONS SUMMARY

At about 2 AM on April 21, 2010, the dedicated dispersant assets from the Marine Spill Response Corporation (MSRC) and Airborne Support Incorporated (ASI) were activated to respond to the Deepwater Horizon incident. All of the dedicated dispersant aircraft were quickly activated because of the potential magnitude of the spill. By 1200 hours on April 21, 2010, one C-130 spray aircraft and a King Air spotter aircraft were ready for spray operations from Stennis International Airport in Mississippi and one BT-67 spray aircraft and an Aero Commander spotter aircraft were ready for spray operations from the Houma International Airport in Louisiana. These initially activated aircraft had a combined payload per sortie of 5,500 gallons. The number of aircraft was increased to a maximum of 12 spray aircraft and 8 spotter aircraft with a capability to apply approximately 100,000 gallons of dispersant per day.

The following summarizes initial lessons learned and recommendations to improve what was a safe and highly successful aerial dispersant response. This report represents the opinions of the aerial dispersant group members and were developed from their perspectives as the managers of the aerial dispersant operations at the Houma Command Center during the Deepwater Horizon (DWH) spill response. A more detailed discussion of the lessons learned with additional supporting information and analysis is provided as Attachment 1.

Lesson Learned 1:

1. The surface application of dispersants was not as fully recognized and accepted by the Regional Response Teams (RRTs) as it should have been -- as one of the primary and preferred response tools for this incident, to minimize damage to sensitive shorelines and wildlife in the projected pathways of oil slicks heading toward shore.

   The vast body of dispersant research, field testing, previous use in spill response and prior federal and state agency approvals should have been sufficient for making strategic decisions for the use of Corexit EC9527A and EC9500A during the MC252 response. The search for alternate dispersants during the response, the changes to the FOSC dispersant approval process and the changes in monitoring requirements were disruptive and hindered the effective use of dispersants to protect sensitive shorelines.

Recommendations

1a. The RRTs should establish as response policy that dispersants are an approved and primary response tool for offshore oil spills, where dispersants are needed to protect vital and sensitive natural resources on and near shore. Dispersant policy should assure that appropriate dispersant resources are optimally deployed to meet response needs during the spill. The RRTs should establish only such criteria for dispersant use as are appropriate for the size, nature, location, and environmental conditions associated with the spill and based upon sound scientific research and data.

1b. Dispersants should be recognized as a first line of defense in appropriate near shore and offshore cases because they can be activated quickly, arrive on scene rapidly, cover significant geographic areas and effectively minimize harm to sensitive natural resources.

1c. Government and industry personnel who are responsible for making decisions about the use of dispersants should be knowledgeable about the body of scientific research and analysis on dispersant effectiveness and toxicity available both preceding and following the Deepwater Horizon incident. Research needs should be considered fully before formulating and implementing any new dispersant use criteria, restrictions or prohibitions.

1d. The government's evaluation of the effectiveness and toxicity of individual dispersant products should occur before another spill of national significance occurs. Such evaluations should be based on an objective analysis of the data and at a time when the evaluation will not be subject to sensationalizing media coverage or political pressure associated with a particular incident. Additional research deemed necessary following the Deepwater response should be completed in the near future and the criteria for listing dispersants on the NCP product schedule should be reviewed and revised.

Lesson Learned 2:

2. In the early days of the response, the RRT pre-approval process was followed, and the FOSC's timely approvals led to the efficient and effective application of dispersants. However, Addendum 3 to the EPA Directive (May 26, 2010) which required BP to *"eliminate the surface application of dispersants,"* except in *"rare cases when there may have to be an exemption"* led to substantial dispersant approval delays. To satisfy the "rare-case exemption" required multi-agency, multi-level consultation and an analysis demonstrating that other response techniques were unavailable for the oil slicks identified. The time-consuming and constantly changing approval procedures prevented timely responses to numerous large oil slicks. This placed the shoreline at greater risk of oil coming ashore and diverted staff from other critical responsibilities in order to prepare the supporting documentation for each request.

Recommendations

2a. Improve the RRT dispersant pre-approval process by updating and streamlining the process and procedures while allowing for meaningful and reasonable governmental oversight without unduly burdening or interfering with operational coordination and efficiency.

2b. FOSC daily approval of dispersants should be based solely on whether the dispersant continues to be effective in dispersing the oil. Dispersant operations supervisors should have the authority to decide which oil slicks to spray, the amounts to spray, and the aircraft to be used. SMART oversight and review should continue and be improved as discussed in lesson learned # 5.

2c. RRTs should review and revise dispersant approval processes and operational criteria and policies to expedite and simplify the dispersant pre-approval process, taking into account the lessons learned in the Deepwater Horizon response, pending USCG dispersant regulations which become final on February 22, 2011, and research and operational advancements.

Lesson Learned 3:

3. The energy industry's development of a core dispersant capability based on the system design approach proved instrumental in the success of the aerial dispersant response operations. The system design approach identified for each dispersant application task, the personnel, equipment, and procedures needed to successfully complete the task and ensured integration of all tasks through training and realistic exercises.

   The Deepwater Horizon response demonstrated that aircraft and personnel can be activated from distant locations to quickly produce an effective, large scale response.

Recommendations

3a. Industry, collectively, should seek to develop and manage aerial dispersant application as a **global** response tool.

3b. Using the system design approach as applied to the aerial dispersant mission, dispersant service providers should work together to standardize operating procedures and equipment. This would improve joint operations, web-based situational awareness and flight and spray documentation.

3c. Spotter/reconnaissance/spray aircraft should be outfitted with satellite phones for communicating with their staging base to facilitate the rapid flow of information versus waiting for the aircraft to land to provide time critical information (e.g., state of oil, dimensions and location of oil slicks, etc.). Spotter/reconnaissance aircraft should be outfitted with marine band radios for coordination of spray operations with vessels.

3d. Government and contract observers and spotters should, to the maximum extent practical, be comprised of individuals who are well-trained and experienced to recognize the various stages of oil weathering, what is dispersible and non-dispersible oil, indicators of dispersant effectiveness and the difference between oil and biological material (e.g., seaweed and algae bloom). Standardized approaches and training in documenting and reporting observations is also necessary so that staging and command center management will have sufficient, consistent and accurate information for appropriate decision making.

3e. Spray and spotter aircraft providers and the response cooperatives that manage aerial dispersant assets should work closely together (i) to standardize operating procedures, aircraft tracking equipment and communication and documentation equipment and (ii) to coordinate response plans that provide a unified U.S. aerial response capability for worst case discharges.

Lessons Learned 4:

4. Inclusion of an embedded science evaluation and analysis team within the Houma Operations Aerial Dispersant Group enabled the Group to address in real-time important issues such as dispersant efficacy, application effectiveness, and monitoring of possible dispersant and dispersed oil impacts on the marine environment. Additionally, the science team was able to help ensure timely and informed responses to the Unified Command, public and government agency requests for scientific and technical information on dispersants and potential dispersant and dispersed oil impacts.

Recommendations

4. Future spill responses that might involve potentially significant dispersant applications should have an embedded Dispersant Science Team that is integrated within the Aerial Dispersant Group to:
   - Assess dispersant effectiveness in real-time.
   - Conduct monitoring and data collection regarding dispersant use and impact, such as, concentrations of oil and dispersant at the water surface and at depth, and address questions regarding potential environmental impacts.
   - Respond to Unified Command, public and government agency requests during the response regarding scientific and technical information on dispersants, including, as appropriate and required: information on the use of dispersants in prior spills, field data and analyses as available during the incident, and laboratory studies.

Lessons Learned 5:

5. SMART did not work as originally envisioned and as stated in the SMART Protocols.

Recommendations

5a. Review and improve SMART observation procedures, data deliverables, and method of delivery based upon field experience implementing SMART Tier 1, 2, and 3 procedures during the Deepwater Horizon response. Implementation of SMART is critical for assessment of dispersant effectiveness and continued dispersant application during a response.

5b. SMART data, photographs and observations should be collected in a webserver that is accessible by different organizations during the response and reviewed on a daily basis with the Aerial Dispersant Group so that they can refine operations, clarify observations, and coordinate the next day's spray/SMART missions.

5c. Update the SMART manual to address data collection, interpretation, presentation and QA/QC. As part of this activity, cross-calibration of instrumentation, personnel observations, and data collection procedures should be developed to standardize results from different teams/individuals.

5d. Initiate and sustain ongoing training of personnel who will conduct SMART Tiers 1, 2 and 3 procedures so that these responders remain proficient in the use, maintenance and calibration of the instruments and in operational procedures, data security, data interpretation and presentation, and documentation to eliminate the need for initial or refresher training of SMART personnel at the time of the response.

5e. SMART monitoring should <u>not</u> be required for every spray sortie once dispersant efficacy has been established. The SMART Team Leader, in consultation with the Environmental Unit, should be authorized to tailor monitoring plans for the response to meet FOSC, UC, and RRT needs.

5f. Aerial dispersant operators and SMART observers should, at the commencement of spray operations, meet to discuss communications and joint operational procedures to ensure timely SMART/spray aircraft rendezvous at the dispersant application site. Coordination would be further facilitated by embedding a SMART member in the Aerial Dispersant Group and at the aerial dispersant staging base.

Lessons Learned 6:

6. During the Deepwater Horizon incident, it became apparent that key regulatory decision-makers, numerous elected officials, the media and the public lacked an understanding of dispersants, their importance, their pre-approvals and past utilization, the non-toxic nature of the surfactants, and the safety measures employed to minimize any potential harmful impacts. As a consequence, uninformed opinions and anxiety supplanted reasoned, trained and educated dialogue, in turn leading to needless delays, impediments and distractions during the response.

Recommendations

6a. Affirmatively educate the public, media, regulatory agencies and elected officials at the Federal, State and local levels about the value, safety, and benefits of using dispersant, *from the outset of the response*. During the response, timely and regularly inform such stakeholders about where and why dispersants are being applied, how the dispersants are being applied, the precautions being taken to protect the public, the environment and response workers, and the benefits being achieved by the dispersants being applied. Maintain an open, continuous dialog with the media and an outreach program to stakeholders throughout the response. Federal, State and Responsible Party responders should work together to agree to and provide accurate and timely information to ensure the information will be accepted and correctly acted upon during the response, and to address potential fears and concerns of the public.

6b. Immediate information sharing, risk communication and outreach efforts to the media, public and elected officials should to be implemented by Unified Command when dispersants are to be utilized on a response. Furthermore, consideration should be given to embedding a person in the Aerial Dispersant Group to coordinate and manage this effort through the JIC.

6c. Government officials with dispersant decision-making or oversight responsibilities should be provided with an in-depth briefing on completed dispersant research and facts so that these officials can make sound environmental response decisions. Additionally, federal agency representatives and responsible parties should timely explain dispersant use decisions to the general public during a response.

6d. Each RRT should implement and institutionalize a dispersant authorization training and exercise program for their members and decision makers so that they better understand the process, regulations, operations, equipment, monitoring and the health and safety aspects of dispersant use and the lessons learned from previous responses.

6e. Ecological risk assessment workshops should be conducted in each RRT, *in advance of the next incident of national significance*, to ensure full discussions and consensus among decision makers and environmental experts about the use of dispersants and the operational and environmental trade-offs in using dispersants versus other response techniques.

Lessons Learned 7:

7. The best means of identifying dispersible oil was with trained, experienced dispersant aircraft spotter/reconnaissance pilots and observers. Current aerial remote sensing and satellite imagery and operations proved ineffective and inconsistent in identifying dispersible oil and providing timely observations/reports for spray operations. For aerial dispersant operations, satellite and remote sensing systems often did not locate the thickest parts of the oil slick, i.e., the portion that is dispersible, or they identified non-oil targets such as algae and sea weed as being dispersible.

Additionally, the reports from these systems were not able to be provided early in the morning to permit a full day of aerial application due to the unavoidable timing of the satellite over passes and the scheduling and processing of imagery.

Recommendations

7a. Improve photographic capabilities on spotter/reconnaissance aircraft. Improved photography can significantly assist the evaluation of dispersant effectiveness by more clearly showing the change in color and shape of an oil slick after being sprayed with dispersant. Improved photography can also provide more accurate data to assess the size (length, width and percent coverage) of an oil slick and estimate the amount of the oil in the slick. Having this information facilitates better assignment of spray aircraft to match the swath width and payloads to specific slicks. Efforts should also be made to forward data directly from aircraft to command centers and staging bases for evaluation.

7b. Improve air-to-surface communications. Each spotter/reconnaissance aircraft should be fitted with a marine band radio to communicate with vessels which are either conducting SMART monitoring or are near the spray area and need to be advised of pending spray operations. Also, satellite phones should be required to ensure that spotter/reconnaissance and spray aircraft can communicate with their staging base to relay information on the movement and configuration of slicks over time, to assist in daily operational response planning, report on the effectiveness of the dispersant and size of the oil slick, etc. During this response many of the aircraft did not have this capability and had to return to base to provide information. This caused a delay of an hour or more in information transfer from some aircraft. Finally, each aircraft should have an intercom system with an available headset for every seat in the aircraft to enable communication among observers and pilots.

7c. All personnel serving as observers/spotters should be trained to recognize when dispersant is effective, the various stages of oil weathering and dispersible and non-dispersible oil. They should also be trained to know the specific observations that need to be made and how to document these observations for each sortie so that ground management will have sufficient and accurate information to make appropriate, timely decisions.

Lessons Learned 8:

8. The response strategy for using aerial dispersants in conjunction with mechanical recovery and in-situ burning should continue to be developed, refined, communicated, coordinated and executed to maximize the removal of oil from surface waters during a response.

Recommendations

8a. RRTs should set a primary response objective and metric for offshore oil spills to be; <u>the most expeditious removal of the most oil from surface waters, consistent with safe practices and other response objectives.</u>

8b. RRTs should continue to develop priorities and strategies on how best to simultaneously use mechanical recovery, dispersants and in-situ burning to maximize total surface oil removal.

8c. RRTs should review the various scenarios for the worst case discharges in their areas of responsibility, review currently available response assets and their capabilities to respond to these scenarios and develop response strategies that maximize surface oil removal. The strategies developed should consider the benefits and timeliness of dispersant response and how best they can be used to minimize shoreline and wildlife impacts and damages.

8d. RRTs should review and update current dispersant policies and procedures to provide consistent criteria and procedures for dispersant operations. In appropriate circumstances, policies might address issues such as dispersant volume/area/time limitations, wave height limitations, pre-approval information requirements, and criteria and procedures for the surface application of dispersant over extended time periods.

8e. RRTs should consider implementing consistent, uniform dispersant policies and procedures to facilitate the new U.S. Coast Guard regulations which require certain vessel and facilities to be able to apply approximately 50,000 gallons of dispersant over a three day period. These USCG regulations are scheduled to take effect in February 2011.

3. INCIDENT OVERVIEW

Description of Initial Response Activities.

On April 20, at approximately 9:30 p.m. the Deepwater Horizon (DWH), a drilling rig approximately 49 miles off the coast of Louisiana in the Gulf of Mexico in Mississippi Canyon Block 252 (MS 252), exploded and caught fire allowing oil and gas to flow up the riser to the ocean surface. The explosion killed 11 platform workers and injured 17 others. Another 98 people survived without serious physical injury. The U.S. Coast Guard log reports "Potential environmental threat is 700,000 gallons of diesel on board the Deepwater Horizon and estimated potential of 8,000 barrels per day of crude oil, if the well were to completely blowout." Much of the oil initially spilled was burned. Surface sheening was observed extending up to 2 miles from the source. The log also reports that attempts to shut the Blow-Out Preventer (BOP) using a ROV failed.

Dedicated aerial dispersant spray and spotter aircraft were activated at approximately 2 AM on April 21, 2010, and were in place at Stennis International Airport in Mississippi and at Houma International airport in Louisiana by 1200 on April 21, 2010 with the capacity to apply 5,500 gallons of dispersant per sortie (round trip from their staging airport).

Two days later the rig capsized and sank, causing the 5,000 foot pipe that connected the wellhead to the drilling platform to bend and release a large slick that began spreading at the former rig site. This resulted in an uncontrolled subsea release of oil. The amount of oil being released was originally estimated at 1,000 bbls per day and, over the period of the response, the estimate was increased several times. A worst case scenario of 162,000 bbls per day was reported on the Dispersant Pre-Approval Initial Call Checklist submitted by BP.

On April 22, the incident-specific members of the Region 6 Regional Response Team (RRT) activated the use of dispersants as a response method in the dispersant pre-authorized areas offshore. On April 22nd a successful initial spray trial of 1,880 gallons of Corexit 9527 dispersant was applied by Airborne Support Incorporated (ASI) on an oil slick near the source. The USCG observers and O'Brien's observer, Josh Dubach, verbally reported to the Unified Command that the Corexit dispersant was effective on the DWH crude oil.

Figure 1 below shows the location of the source release site, the two aerial dispersant staging bases, the distances to shore and to the dispersant staging bases and the location of the initial dispersant application.

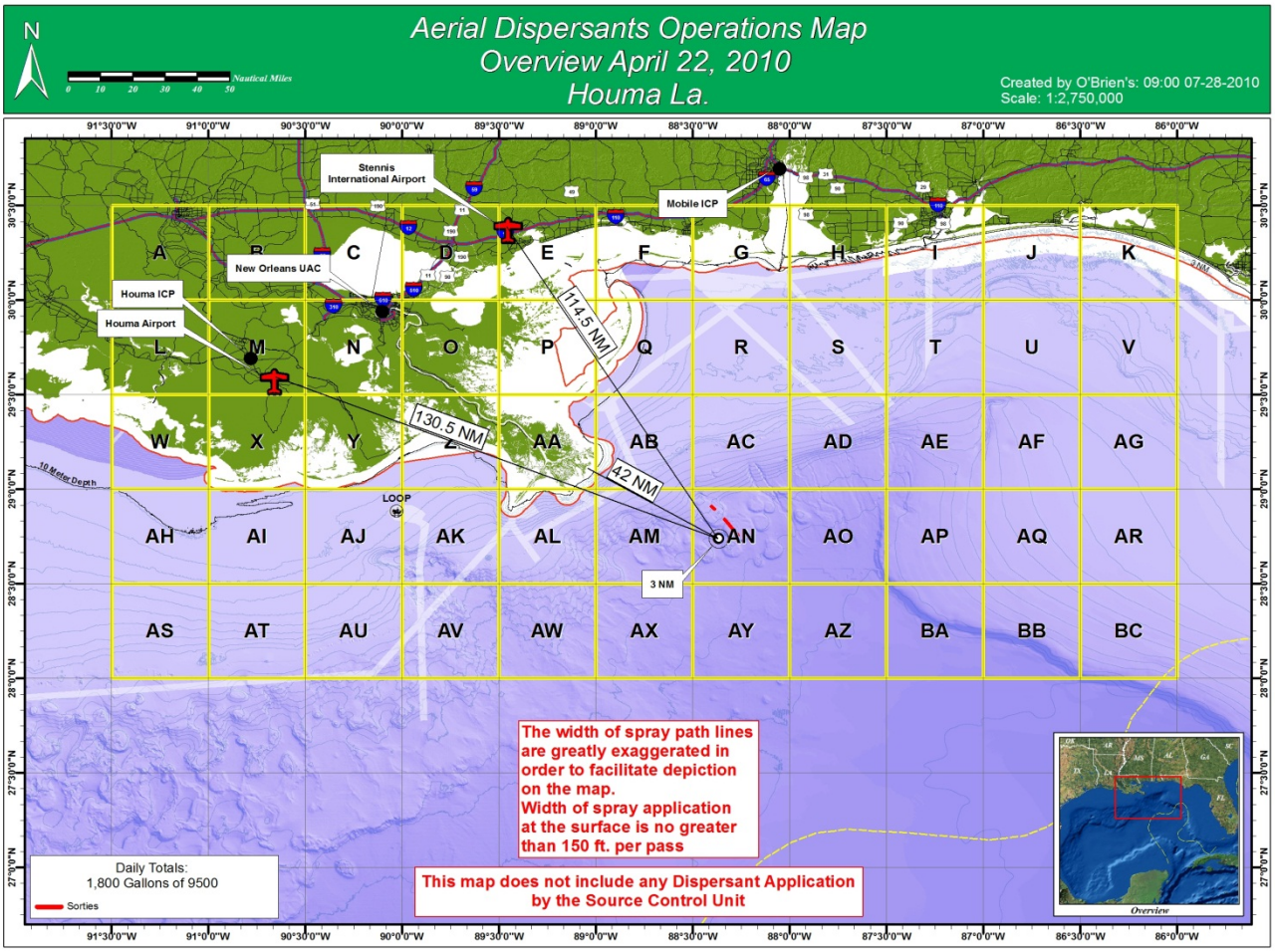


FIGURE 1: Map of Source Site, Dispersant Staging Bases and Initial Dispersant Application Location

Once aerial dispersant application was authorized, the Houma Aerial Dispersant Group was activated, and additional dispersant assets (airplanes, dispersant stockpiles and response personnel) were brought into service. By April 25, 2010, multiple sortie and aircraft spray operations from Houma and Stennis dispersant staging bases began (NOAA Situation Update for April 25, 2010). At this point, the slick covered approximately 600 square miles.

On April 28, the Coast Guard reported the flow of oil to be 5,000 barrels per day (bpd) (210,000 gallons per day) -- five times greater than first estimated. On May 6, oil washed ashore on the Chandeleur Islands, uninhabited barrier islands off the Louisiana coast that are part of the Breton National Wildlife Refuge. By May 19, the first heavy oil from the spill washed ashore in Louisiana marshlands and even more oil entered the loop current.

The primary BP response focused on capping the well. Over a period of 80+ days from the initial explosion, BP continued its efforts to cap the well. An overview of the timeline is presented below.

Date (2010)	Action / Result
20 April	Initial explosion and fire; 700,000 gallons of diesel on board the rig
22 April	Fire rages and rig sinks – most of the diesel fuel is assumed to be consumed by the fire
24 April	ROV's determine that the wellhead is leaking
28 April	Revised estimate of the volume being discharged from the well head
7 – 9 May	Cofferdam Containment Dome installed – removed due to hydrate build-up making it ineffective
12 May	Live video feed of well head leads to discharge estimates issued by independent, non-government scientists
15 – 16 May	BP inserts pipe in riser to siphon off some of the spilling oil to be collected on a vessel on the surface
26 – 29 May	Initial attempt to choke and kill (Top Kill) the well through the use of heavy drilling mud (unsuccessful)
27 May	Flow Rate Technical Group estimates discharge rate
1 June - 10 July	BP begins third attempt to contain the oil from the leaking well using a Lower Marine Riser Package (LMRP) Cap Containment System. After slicing off the top of the broker riser above the blow-out preventer, a Top Cap is put in place to begin channeling the leaking oil and gas to a vessel on the surface; oil continues to leak from the Top Cap and make its way to the surface.
10 June	Flow Rate Technical Group revises discharge estimate
mid-to-late June	Hurricane Alex requires relief rigs to uncouple and allow the oil to leak unchecked into the Gulf
10 – 12 July	Removal of the initial LMRP Top Cap to replace it with a new cap that contains all of the oil leaking out of the riser
12 July	Three ram capping stack installed
15 July	Day 85: BP closes the valves on the new cap and stops the oil leaking out of the riser at 2:25 p.m. CDT
25July	Tropical Storm Bonnie occurs causing delays in preparation for static top kill
3-6 Aug	Static top kill executed and effective
4 Aug	Federal government publishes Deepwater Horizon MC252 Gulf Incident Oil Budget
19 Sept	BP confirms that well kill operations on the MC252 well in the Gulf of Mexico are now complete, with both the casing and annulus of the well sealed by cement

Estimated Quantity and Potential Quantity

The DWH MC-252 release is the largest marine oil spill in history and the second largest spill in history. DWH produced a major oil spill that lasted approximately 86 days. The following photographs indicate the size and magnitude of the surface oil slicks created.

May 12 May 22 May 30

The Aerial Dispersant Group's response to the DWH MC 252 release was continuously ongoing for 90 days from April 21 to July 19, approximately 4 days after the well was capped and the flow of oil stopped. At this point the aerial dispersant assets were reduced to include two spotter/spray aircraft at Stennis International airport and two spray and two spotter aircraft at Houma airport. Upon shutting in of the well (bottom kill), all remaining dispersant assets and the Houma Aerial Dispersant Group were demobilized. Onshore cleanup response, logistics, decontamination, and research activities and other response activities continued.

Completed Dispersant Pre-Approval Initial Call Checklist and FOSC Dispersant Use Checklist are provided as Attachment 2.

Environmental Conditions

The incident occurred approximately 49 miles off the Louisiana coastline in water depths exceeding 5,000 feet. Dispersant was applied with aircraft over an operational area of approximately 18,000 square miles. All dispersant applications were applied greater than 3 nm offshore, and 98% of the dispersant was applied greater than 10 nm offshore. The RRT 4 and 6 response plans provide excellent summaries of the offshore environmental situation. The weather and sea conditions changed considerably over the course of the spill and are documented in the NOAA weather reports.

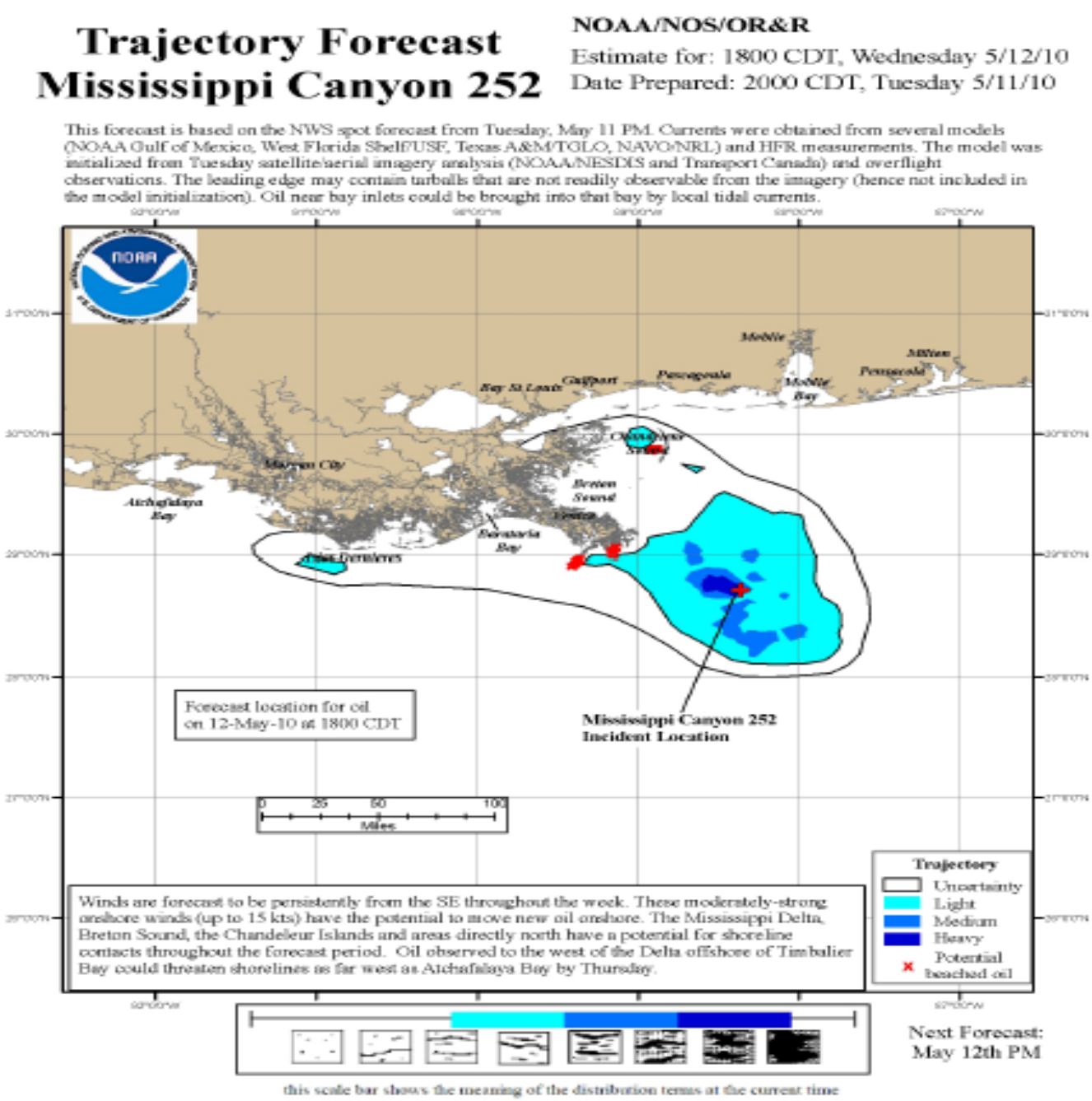
4. OIL SLICK TRAJECTORY AND BEHAVIOR

Expected Movement of the Slick

Strong southerly winds in the Gulf helped to increase the spread of oil initially released. A few days after the explosion, the oil was estimated to cover 580 square miles (1,500 km2) and could be observed 31 miles from the Chandeleur Islands. An April 30 estimate placed the total spread of the oil at 3,850 square miles (10,000 km2). The spill quickly approached the Delta National Wildlife Refuge and Breton National Wildlife Refuge. First shoreline impact occurred in the Chandeleur Islands on May 6, with measureable shoreline area (1 mile) being reported on May 11.

The oil slick trajectories provided by NOAA/NOS/OR&R were used for dispersant response operations. Since these trajectories are numerous they are not provided as a part of this report. The NOAA/NOS/OR&R trajectories can be accessed on the NOAA web site at http://response.restoration.noaa.gov/. An example of the NOAA Trajectory used during the spill response is shown in Figure 2 below.

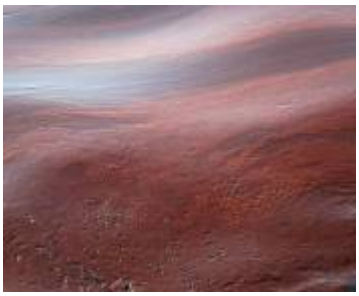
FIGURE 2: NOAA Trajectory Information Published for Deepwater Horizon Release



Expected Weathering and Behavior of the Product

The behavior of the fresh oil continuously rising to the surface near the subsea release site remained highly dispersible. As the oil moved towards shoreline approximately 50 miles from the source site, it became more weathered and emulsified and turned a reddish orange color. The oil eventually weathered/emulsified to the point that dispersants were either ineffective or higher dosages were required to cause changes in the structure of the slick.[1] See photographs below of the slicks at various distances from the source.

Oil 5 nm from Source* Oil 10 nm from Source* Oil 17 nm from Source*



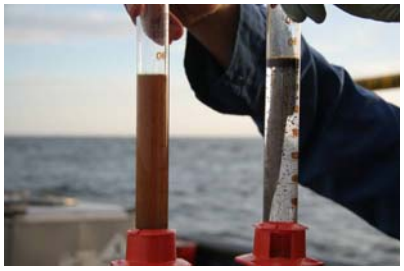
* Photos from SINTEF report "Assessment of DWH oil at different stages of weathering"

Studies by SINTEF and S.L. Ross and others evaluated the emulsions. SINTEF concluded, "The sampled emulsions have a span in viscosity from 1000 to 7000 mPa (reported at 30 rpm). All the tested emulsions showed good dispersibility in the Field Effectiveness Test. The test does not measure the dispersibility quantitatively. It does, however, document the formation of small droplets upon treatment with dispersants. It is therefore thought that, given the presence of breaking waves, the tested slicks would have dispersed, if treated with dispersants at sufficient dosages." Figure 3 shows the dispersant action on the weather/emulsified oil from the SINTEF analysis.

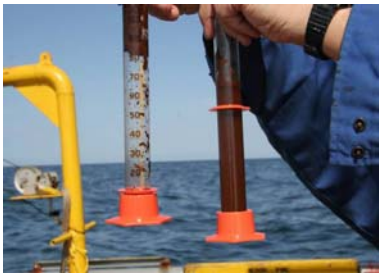
[1] One field trial suggested that these higher doses were in the rage of 10-15 gallons per acre.

FIGURE 3: Images of the Field Effectiveness Test after addition of dispersants and agitation. The dispersant treated sample versus untreated sample. SINTEF assessment of dispersibility of DWH oil at different stages of weathering

Sample Position 4
11 nm from source



Sample Position 2
15 nm from source



Sample Position 3
18 nm from source

5. Justification for Dispersant Use

Why Use Dispersants?

A primary objective of oil spill response strategies is to reduce environmental damage to the greatest extent possible. For responders, that means working to prevent the spilled oil from coming into contact with sensitive resources that are particularly vulnerable to oil impact.

The close proximity of the environmentally sensitive areas of the Louisiana coastline made the Louisiana shore particularly vulnerable to oil spill impact. The region is rich in wildlife and supports a thriving fishery that provides significant economic value to the communities on the Gulf Coast. The marsh and shore areas of Louisiana are the spawning grounds for these natural resources and are of the highest priority for protection. The impact area of the DWH release, which extends to the shoreline areas of Texas, Mississippi, Alabama and Florida, compounds the response efforts. Only some of the oil released from the well could be contained and recovered with boom and skimmers, or burned. This is due in part to the wind and wave limitations of these response tools. It is not possible to capture all of the oil with these methods in all weather conditions. Dispersants, however, are effective in a wider range of wind and sea states. The aerial application of dispersants is the only response tool capable of responding to a large, offshore oil spill. Aircraft can arrive on scene quickly and disperse significant quantities of oil over a large operational area that is thousands of square miles in size.

Potential Impact Areas and Their Respective Sensitivities to Impact

The potential impact areas are described here in general terms. The RRT response plans and the individual state resources-at-risk data bases provide detailed identification of the habitat, and the magnitude and sensitivities of resource populations. The following identifies some of the resources that were at risk for impacts from the DWH release.

- Fishing: On May 3, 2010, the *Wall Street Journal* estimated that Louisiana's seafood industry provides up to 40 percent of the U.S. seafood supply. NOAA estimated that the seafood industry employs 90,000 people in Louisiana and that certain communities are almost wholly dependent upon the fishing industry. The state is the second-biggest U.S. seafood harvester and the top provider of shrimp, oysters, crab and crawfish. On May 3, 2010, the *Wall Street Journal* valued the total commercial fishing industry harvest on the Gulf Coast at $21 Billion. The Louisiana Department of Wildlife & Fisheries estimated in 2006 that saltwater recreational fishing in Louisiana had a total economic impact of approximately $757 million and supported over 7,700 jobs.

- Maritime Transportation: The Port of South Louisiana, which stretches 54 miles along the Mississippi River, is the largest tonnage port in the Western Hemisphere and ranks fifth in the world. The statistics of the Port of South Louisiana show that the Port handled over 233 million tons of cargo in 2008 via vessel, barge, rail, and truck. Over 4,000 oceangoing vessels and 55,000 barges call at the Port of South Louisiana each year, making it the top ranked in the country for export tonnage and total tonnage.

  The Louisiana Offshore Oil Port (LOOP) handles 13 percent of the nation's foreign oil, about 1.2 million barrels a day, and connects by pipeline to 50 percent of the U.S. refining capability *(Associated Press , Friday May 7, 2010)*. The oil spill trajectory and actual movement of the Deepwater Horizon oil, lay in the path of vessel traffic routes to and from LOOP and the Ports on the Mississippi River.

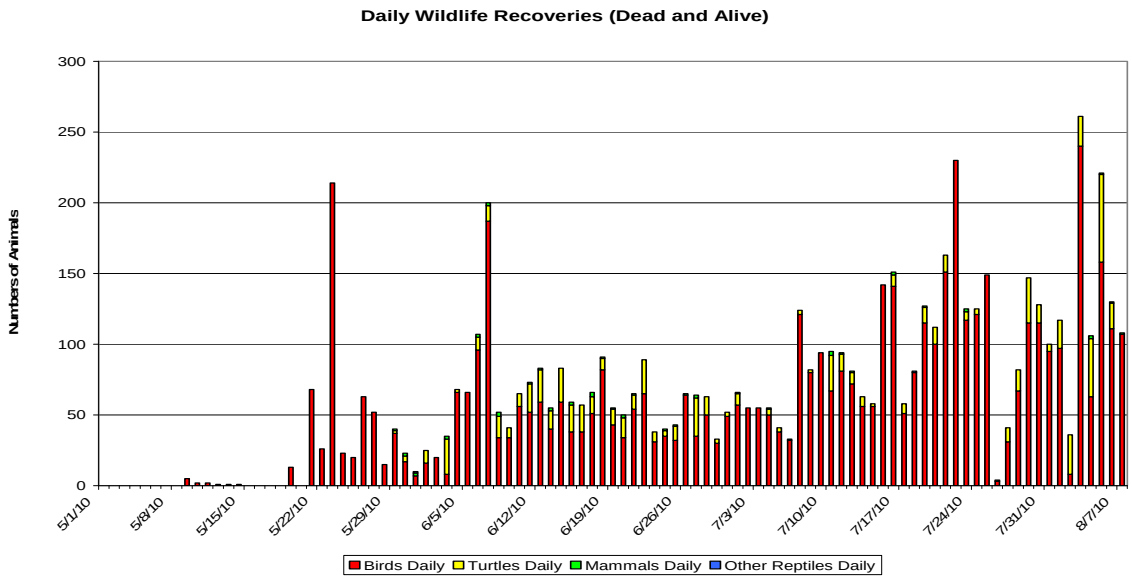
- Tourism: The Louisiana Office of Tourism estimates the value of tourism to Louisiana at $9 billion. The EPA estimates the value of the total Gulf tourism industry at $20 billion

  - Environmental - Marshes & Beaches: As of July 27 approximately 640 miles of Gulf Coast shoreline was oiled—approximately 362 miles in Louisiana, 108 miles in Mississippi, 70 miles in Alabama, and 100 miles in Florida as reported by the SCAT teams.

    It should be noted that measureable oiling of the shoreline did not occur until mid-May, approximately three weeks after the blowout even though the spill occurred only 50 miles offshore. During this period the aerial application of dispersants was the primary response tool and applied approximately 30,000 gallons of dispersant per operational day. The delay in significant shoreline impact indicates that the extensive use of dispersant early in the response may have been a significant factor in delaying shoreline impacts and, thus, significantly reduced onshore environmental damages.

- Wildlife: Figure 4 shows the wildlife impacts as of July 27, 2010 when no further significant oil slicks were identified offshore by the aerial dispersant team's surveillance. The daily wildlife impacts (confirmed deaths and injuries) are from reports by the Wildlife Unit during the DWH response, an example of which is shown below for August 5, 2010.

Figure 4 Wildlife Impacts



Birds

	Consolidated #'s Collected Alive							
	Visibly Oiled		No Visible Oil		Pending		Total	
	Collected Yesterday	Total	Collected Yesterday	Total	Collected Yesterday	Total	Collected Yesterday	Total
Alabama	5	115	0	0	0	0	5	115
Florida	7	211	0	0	0	0	7	211
Louisiana	28	1358	0	0	0	0	28	1358
Mississippi	0	85	0	0	0	0	0	85
Texas	0	0	0	0	0	0	0	0
On-Water	0	0	0	0	0	0	0	0
Total	40	1769	0	0	0	0	40	1769

	Consolidated #'s Collected Dead							
	Visibly Oiled		No Visible Oil		Pending		Total	
	Collected Yesterday	Total	Collected Yesterday	Total	Collected Yesterday	Total	Collected Yesterday	Total
Alabama	2	111	2	307	0	1	4	419
Florida	2	175	8	526	0	0	10	701
Louisiana	60	1072	14	828	0	0	74	1900
Mississippi	1	225	8	348	0	13	9	586
Texas	0	0	0	0	0	0	0	0
On-Water	0	0	0	0	0	0	0	0
Total	65	1583	32	2009	0	14	97	3606

	Consolidated #'s Total Collected							
	Visibly Oiled		No Visible Oil		Pending		Total	
	Collected Yesterday	Total	Collected Yesterday	Total	Collected Yesterday	Total	Collected Yesterday	Total
Alabama	7	226	2	307	0	1	9	534
Florida	9	386	8	526	0	0	17	912
Louisiana	88	2430	14	828	0	0	102	3258
Mississippi	1	310	8	348	0	13	9	671
Texas	0	0	0	0	0	0	0	0
On-Water	0	0	0	0	0	0	0	0
Total	105	3352	32	2009	0	14	137	5375

	Consolidated #'s Released
	Total
Alabama	38
Florida	15
Louisiana	563
Mississippi	26
Texas	0
On-Water	0
Total	642

Sea Turtles

	Collected Alive							
	Visibly Oiled		No Visible Oil		Pending		Total	
	Collected Yesterday	Total	Collected Yesterday	Total	Collected Yesterday	Total	Collected Yesterday	Total
Alabama	0	5	1	4	0	0	1	9
Florida	0	2	0	13	0	0	0	15
Louisiana	0	3	0	6	0	0	0	9
Mississippi	0	0	0	28	0	0	0	28
Texas	0	0	0	0	0	0	0	0
On-Water	44	386	0	12	0	0	44	398
Total	44	396	1	63	0	0	45	459

	Collected Dead							
	Visibly Oiled		No Visible Oil		Pending		Total	
	Collected Yesterday	Total	Collected Yesterday	Total	Collected Yesterday	Total	Collected Yesterday	Total
Alabama	0	6	0	5	1	82	1	93
Florida	0	1	0	0	0	55	0	56
Louisiana	0	5	0	2	0	97	0	104
Mississippi	0	1	0	75	1	174	1	250
Texas	0	0	0	0	0	0	0	0
On-Water	0	4	0	0	0	1	0	5
Total	0	17	0	82	2	409	2	508

	Total Collected							
	Visibly Oiled		No Visible Oil		Pending		Total	
	Collected Yesterday	Total	Collected Yesterday	Total	Collected Yesterday	Total	Collected Yesterday	Total
Alabama	0	11	1	9	1	82	2	102
Florida	0	3	0	13	0	55	0	71
Louisiana	0	8	0	8	0	97	0	113
Mississippi	0	1	0	103	1	174	1	278
Texas	0	0	0	0	0	0	0	0
On-Water	44	390	0	12	0	1	44	403
Total	44	413	1	145	2	409	47	967

	Released				
	Total	# Nests Transported		# Hatchlings Released	
		Collected Yesterday	Total	Collected Yesterday	Total
Alabama	1	1	3	0	0
Florida	0	29	161	359	2796
Louisiana	0	0	0	0	0
Mississippi	15	0	0	0	0
Texas	0	0	0	0	0
On-Water	71	0	0	0	0
Total	87	30	164	359	2796

Mammals*
* Includes Dolphins

	Collected Alive							
	Visibly Oiled		No Visible Oil		Pending		Total	
	Collected Yesterday	Total	Collected Yesterday	Total	Collected Yesterday	Total	Collected Yesterday	Total
Alabama	0	0	0	1	0	0	0	1
Florida	0	1	0	2	0	0	0	3
Louisiana	0	0	0	1	0	0	0	1
Mississippi	0	0	0	0	0	0	0	0
Texas	0	0	0	0	0	0	0	0
On-Water	0	0	0	0	0	0	0	0
Total	0	1	0	4	0	0	0	5

	Collected Dead							
	Visibly Oiled		No Visible Oil		Pending		Total	
	Collected Yesterday	Total	Collected Yesterday	Total	Collected Yesterday	Total	Collected Yesterday	Total
Alabama	0	0	0	3	0	3	0	6
Florida	0	0	0	1	0	0	0	1
Louisiana	0	2	0	34	1	2	1	38
Mississippi	0	1	0	14	1	6	1	21
Texas	0	0	0	0	0	0	0	0
On-Water	0	0	0	1	0	0	0	1
Total	0	3	0	53	2	11	2	67

	Total Collected							
	Visibly Oiled		No Visible Oil		Pending		Total	
	Collected Yesterday	Total	Collected Yesterday	Total	Collected Yesterday	Total	Collected Yesterday	Total
Alabama	0	0	0	4	0	3	0	7
Florida	0	1	0	3	0	0	0	4
Louisiana	0	2	0	35	1	2	1	39
Mississippi	0	1	0	14	1	6	1	21
Texas	0	0	0	0	0	0	0	0
On-Water	0	0	0	1	0	0	0	1
Total	0	4	0	57	2	11	2	72

	Released
	Total
Alabama	1
Florida	0
Louisiana	0
Mississippi	0
Texas	0
On-Water	0
Total	1

Other Reptiles

	Collected Alive							
	Visibly Oiled		No Visible Oil		Pending		Total	
	Collected Yesterday	Total	Collected Yesterday	Total	Collected Yesterday	Total	Collected Yesterday	Total
Alabama	0	0	0	0	0	0	0	0
Florida	0	0	0	0	0	0	0	0
Louisiana	0	0	0	0	0	1	0	1
Mississippi	0	0	0	0	0	0	0	0
Texas	0	0	0	0	0	0	0	0
On-Water	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	1	0	1

	Collected Dead							
	Visibly Oiled		No Visible Oil		Pending		Total	
	Collected Yesterday	Total	Collected Yesterday	Total	Collected Yesterday	Total	Collected Yesterday	Total
Alabama	0	0	0	0	0	1	0	1
Florida	0	0	0	0	0	0	0	0
Louisiana	0	0	0	0	0	0	0	0
Mississippi	0	0	0	0	0	0	0	0
Texas	0	0	0	0	0	0	0	0
On-Water	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	1	0	1

	Total Collected							
	Visibly Oiled		No Visible Oil		Pending		Total	
	Collected Yesterday	Total	Collected Yesterday	Total	Collected Yesterday	Total	Collected Yesterday	Total
Alabama	0	0	0	0	0	1	0	1
Florida	0	0	0	0	0	0	0	0
Louisiana	0	0	0	0	0	1	0	1
Mississippi	0	0	0	0	0	0	0	0
Texas	0	0	0	0	0	0	0	0
On-Water	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	2	0	2

	Released
	Total
Alabama	0
Florida	0
Louisiana	0
Mississippi	0
Texas	0
On-Water	0
Total	0

RRT 6 Pre-approval Process and Zone

Pre-Authorization Process: Under The Oil Pollution Act of 1990, the National Response System is the federal government's mechanism for emergency response to discharges of oil into navigable waters of the United States. The system provides a framework for coordination among federal, state, and local responders and Responsible Parties. Structurally, the National Response System is comprised of three organizational levels: a National Response Team (NRT), co-chaired by the U.S. Coast Guard and the Environmental Protection Agency, Regional Response Teams (RRTs), and Area Committees (ACs). In addition to regional planning and

response to federal incidents, the RRTs are vested with the authority over the use of dispersants.

RRTs 4 and 6 have a long-established dispersant pre-approval process. The RRT 6 process is described in *FOSC DISPERSANT PRE-APPROVAL* GUIDELINES (RRT-6 APPROVED JANUARY 10, 1995- Version 4.0, January 24, 2001). This authorization process was implemented in the initial stages of the Deepwater Horizon incident.

Potential for Use of Other Recovery Methods

In addition to aerial dispersants, other response tools used include the following:

- Mechanical Recovery (*data source: DWH web site 27July 2010*)

  Response Vessels

  - Vessels of Opportunity: 1,466
  - Barges: more than 560
  - Skimmers: more than 800
  - Other Vessels: more than 1,500
  - Total active response vessels: more than 4,300
  - 3.47 million gallons of oil recovered as calculated with a 10% recovery rate

- In-Situ Burning

  - Approximately 411 controlled burns were conducted, removing an estimated 11 million gallons of oil. This estimate is based on the volume of oil collected in burn booms and a 95% burn efficiency rate to account for residue after burn.

- Boom

  - Approximately 3.9 million feet of containment boom was deployed in the response

Weather & Sea State

Wind velocity and sea state have a significant impact on the effectiveness of response tools used during the DWH response. Mechanical recovery methods, such as skimmers and use of boom, and controlled or in-situ burns are not effective under all weather conditions.

Approximately 85% of the skimmer systems used in the Deepwater Horizon spill were weir systems, which are the least efficient of the skimmer systems in the open water environment. The remaining 15% were of the skimmer A variety, i.e., brush, drum, rope mop or belt skimmers.

Figure 6 below shows the relative efficiencies of different response tools at various wind and sea states. Figure 6 is a subjective representation, and there may be changes for offshore operational efficiencies. For example, the actual recovery of oil in the open ocean by weir

skimmers may be considerably less and can be in the range of 5-10%. Two vertical lines have been added to the chart with one line showing the 2 foot wave height limit for ISB operations and another showing the 4 foot wave height when mechanical recovery operations commence to be secured. The 2 and 4 foot limits were used during the DWH response. Figure 6 provides a general comparison of the different response tools to assist in designing response strategies.

Figure 6 also shows that dispersants can be applied by air over a wider range of wind and sea conditions with a higher percentage of effectiveness than weir skimmers (Group C), the most prevalent used on the DWH response.

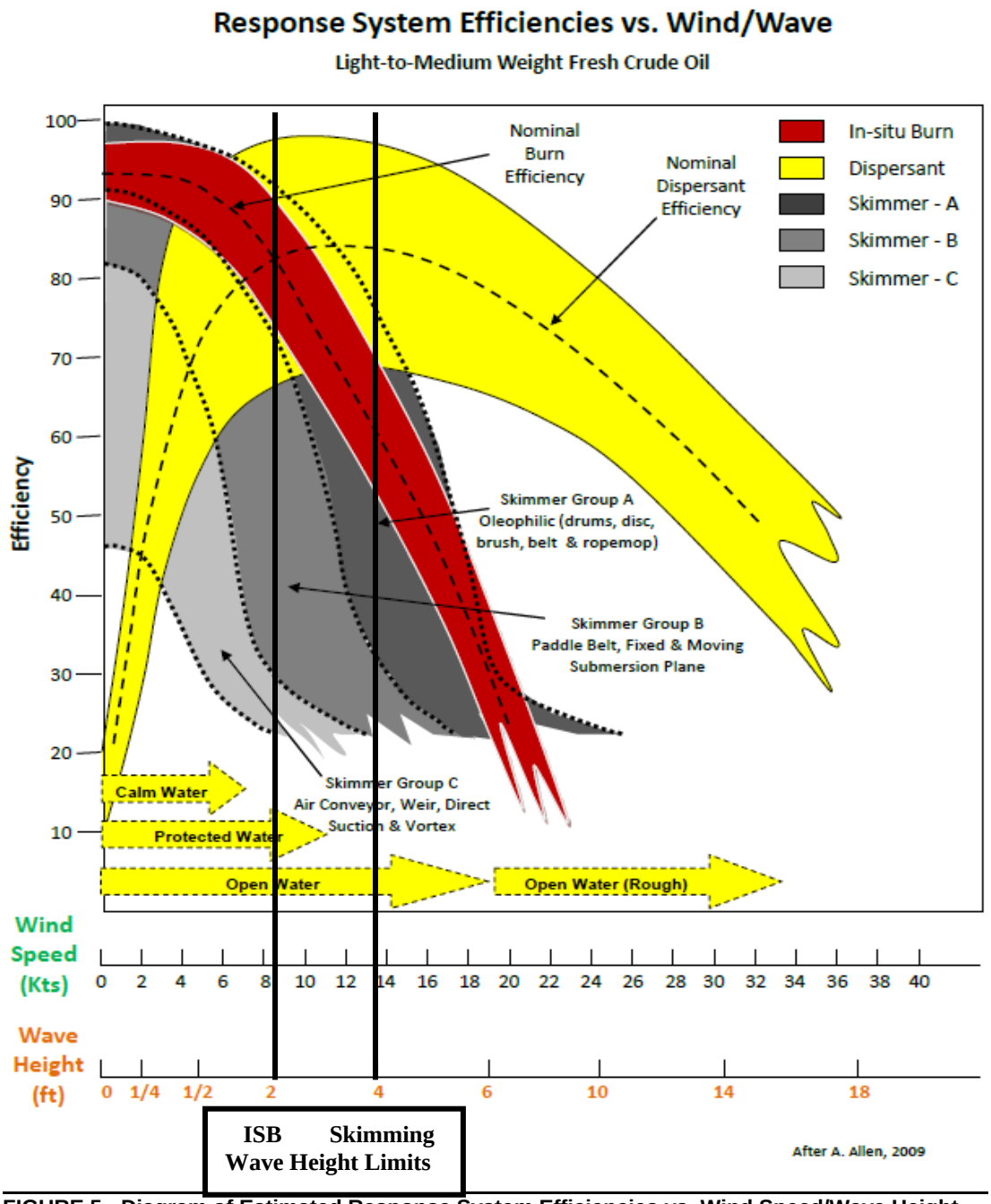


FIGURE 5: Diagram of Estimated Response System Efficiencies vs. Wind Speed/Wave Height

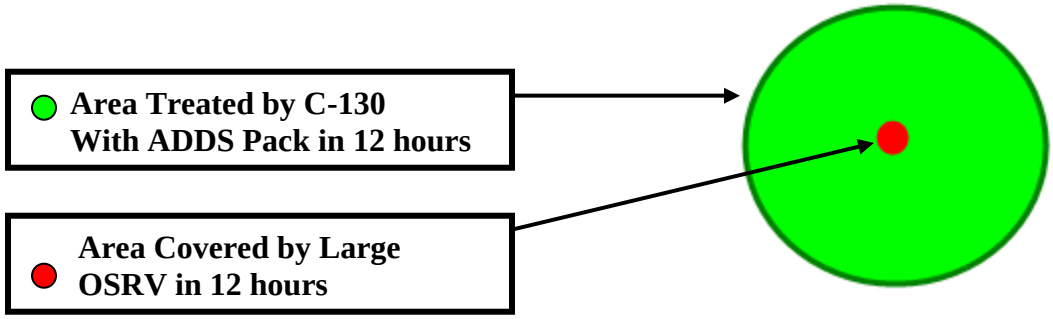
Encounter Rate

Aerial dispersant application has a much higher oil encounter rate than either mechanical recovery or In-situ burning. Mechanical recovery (skimming operations) and In-Situ Burn operations are both limited by encounter rate, i.e. how long it takes a vessel towing a boom at 0.5-1.0 knot to collect sufficient oil to skim or to burn and other limiting factors (e.g., emulsification level of oil). The daily (12 hour) encounter area of the spill by a 200 ft Oil Spill

Response Vessel (OSRV) with a 150 ft swath width is shown as the small red dot. The green circle is the encounter area that can be achieved by a C-130 with a 150 ft spray swath width applying dispersant over the same 12 hour time period.

Multiple oil slicks with coverage areas of 5 to 10 square miles each were identified over the course of the response to the DWH. Under the circumstances presented and in our opinion, the only means of preventing most of the oil in these slicks from reaching shore was aerial dispersant application.

Figure 6: Daily Encounter Area Comparison C-130/ADDS versus Large OSRV



Sea State

Sea state, which is related to wind speeds, is one of the limiting operational criteria for all offshore response tools. Dispersants can be used over a much greater sea state range of operation than the 2 foot or less seas normally required for burning and the 4 foot or less sea states required for most mechanical recovery.

During the DWH response, aerial dispersant application was shown as effective in sea states as low as 0.5 feet. Multiple test applications were conducted with aircraft and boat spray systems. These trials were evaluated using SMART Tier 2 fluorometry. Figure 8 shows the efficacy of dispersants in low wave energy conditions. This, and other tests, confirmed that dispersants were effective on the DWH oil in seas of 0.5 feet and greater.

FIGURE 7: SMART Template - Evaluation of May 23, 2010 Fluorometry Data

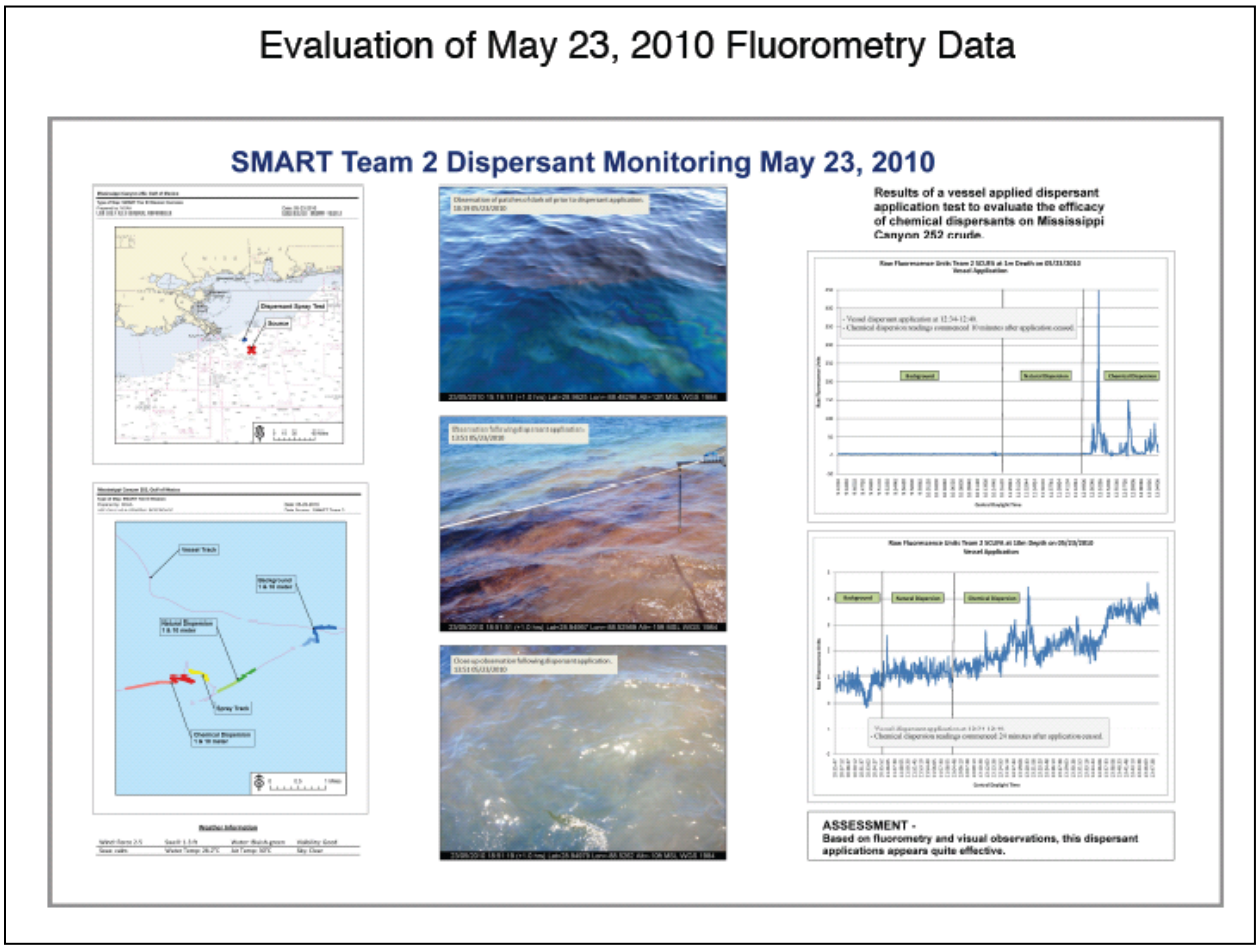


FIGURE 8: Evaluation of May 23, 2010 Fluorometry Data (continued)

The May 23, 2010 dispersant efficacy test described in the above poster was well executed and produced reliable data. The test was conducted on "patches of black oil" using a vessel based dispersant spray system. The sea conditions were calm with a swell of 1-3 ft. and 10-15 kt. winds.

The 1 meter background and natural dispersion readings are stable and show very little difference in fluorescence between the two. The Team Leader noted "brown particles suspended in sheeny water" in the background sample area which would explain the high background readings. After dispersant application the vessel made three monitoring passes through the spray area. These three passes are clearly represented in the data by three distinct peaks in the 1 meter chemical dispersion readings.

The 10 meter data correlates quite well with the 1 meter data though we see a much less dramatic rise in fluorescence in the 10 meter chemical dispersion readings. This is consistent with what we would expect at that depth given the short period of time between the dispersant application and the 10 meter chemical dispersion sampling.

Based on the fluorometry data and visual observations, this dispersant application appears quite effective.

Brian Parscal
July 3, 2010

May 23rd Photograph Showing Dispersant Application Effectiveness In Support of the Fluorometry Data Shown Above

6. CHRONOLOGY OF DISPERSANT RELATED EVENTS

Date	Dispersant Related Event
April 20	▪ MC252 Deepwater Horizon (DWH) platform explodes killing 11.
April 21	▪ BP Houston Command Center requested to use dispersants and commenced directing dispersant operations. At about 0200 CST O'Brien's activated ASI to provide 1 BT-67 and 1 Aero Commander (4 hour wheels-up response time). At about 0200 CST MSRC was activated to provide through IAR 1 C-130 and through Dynamic Aviation 1 King Air (4 hour wheels-up response time). ▪ IAR C-130 arrived Stennis International Airport at 1040 CST. By 1200 CST MSRC's C-130 spray aircraft and King Air spotter aircraft were available for response at Stennis Int'l Airport and ASI's BT-67 spray aircraft and Aero Commander spotter aircraft were available for response at the Houma Int'l Airport.
April 22	▪ ASI was authorized by the FOSC to conduct a 1,880 gallon trail application of dispersant to verify effectiveness on the Macondo crude oil. ASI spotter and spray aircraft departed at 1630 and were on-scene and commenced the first application of dispersants (Corexit 9527) at 1736 local time. USCG and O'Brien's observers reported that the dispersant application was effective.
April 23	▪ Houma Command Center activated and commenced directing aerial dispersant operations. MSRC and O'Brien's personnel arrive at the Houma Command Post to manage the aerial dispersant operations.

Date	Dispersant Related Event
April 25	▪ Second application of dispersants conducted. Additional MSRC dispersant stockpiles requested and en-route. EC9500A and EC9527A dispersants from MSRC and other U.S. Cooperatives and response organizations and from overseas organizations were submitted to procurement and transport to Stennis and Houma airports. The following assets were in place: ➢ STENNIS Air Base (KHSA) - One (1) IAR C-130 spray plane; - One (1) Dynamic King Air Spray plane to serve as spotter; ➢ HOUMA Air Base (KHUM) - One (1) ASI BT-67 spray plane; - One (1) ASI DC-3 spray plane; - One (1) ASI Aero Commander spotter plane ▪ Lynden C-130 with CCA ADDS Pack activated, one additional MSRC/Dynamic King Air spotter/spray aircraft activated, and ASI DC-3 spray aircraft and Aztec spotter aircraft activated. USAFR activated by Area Command.
April 26	▪ Lynden C-130 with CCA ADDS Pack and Dynamic King Air arrives Stennis Int'l Airport.
April 28	▪ Activated additional Dynamic King Air's and crews for spotting for USAFR and Reconnaissance.
April 29	▪ DC3 N64766 conducted an emergency dispersant discharge of approximately 1,000 gallons of Corexit 9500 at (29.2500N; 90.0797W - Western Barataria Bay) due to aircraft engine failure; Two (2) US Air Force C-130 spray aircraft arrive at Stennis Air Base to serve as aerial dispersant spray assets. Divided operating area into zones to deconflict spray operations between Stennis and Houma aircraft.
May 1	▪ Commenced evaluation of establishing an aerial dispersant staging base in the Mobile Command area. Transferred member of dispersant science evaluation team to Area for dispersant well injection project Commenced identification, vetting and field testing of alternate dispersants to Corexit products to increase stockpile capacity. Requested BP Aviation evaluate the use of AT-802's for tactical near shore dispersant spraying. ▪ Set 3 nautical mile "no dispersant spray" safety radius for ISB and well injection operations.
May 2	▪ USAFR considering to move to Hurlburt Field to provide a dispersant base for the Mobile Command area.
May 3	▪ Activated two King Air's to provide spotting for USAFR operating at Hurlburt Field. Ordered three boat spray systems for potential near shore spraying.
May 4	▪ Australia advised dispersant stockpiles not available due to local needs. Evaluated dispersant affect on emulsion in the field.
May 5	▪ AT-802 proposal was approved by BP Aviation for nearshore dispersant application out to 5 nm offshore.
May 6	▪ Aerial Dispersant Group implemented a 3 nm "No-Fly Zone" for the area surrounding the source and the ISB operations and expanded the safety setback to 2 nm for ships, platforms and mammals.

Date	Dispersant Related Event
May 7	▪ Prepared procedures for spotter and spray aircraft to work with SMART helicopters and vessels to enable monitoring of spray passes and provided hand held VHF radios to improve surface to air communications. ▪ Received Lynden Air Cargo report identifying Eastern staging base as Jack Edwards Field and Western staging base as Chennault. ▪ Expanded no spray zone around source site to 5 nm.
May 8	▪ Commenced developing boat spray operations plan and identifying boat spray equipment that sprays neat to facilitate application and monitoring. ▪ Informed by SSC that dispersant approval permitted the application of dispersants by vessels in the pre-approved offshore area.
May 9	▪ Conducted spray operation with OSPR surveillance suite and SMART to verify effectiveness of dispersant operations.
May 10	▪ EPA issued its Dispersant Monitoring and Assessment Directive which required BP to implement SMART Tier 3 for the surface application of dispersants. ▪ Set 15 nm safety zone around source site for testing of subsea dispersant injection. ▪ OSR fluorometry teams arrived from UK and Singapore. ▪ Prepared field dispersant sampling plan for effectiveness and toxicity analysis.
May 11	▪ Dispersant operations were suspended pending an Area Command Staff operational review of the Aerial Dispersant Group management practices. Under the chairmanship of Charlie Henry (NOAA SSC), a list of improvements were identified and dispersant operations were to resume the following day. Improvement included ASI BT-67 to conduct droplet card evaluation prior to resuming spray operations and dispersant application to focus more on slicks near the source site.
May 12	Developed a standard air spotter report form to assist in reporting and describing dispersible oil slicks and documenting the information. ▪ Coordinated with SMART members to share photographs and observations of operations. ▪ Finalized boat spray operations plan. ▪ Prepared computer model spray drift diagrams to show the area where of potential human exposure. For standard operating procedure to spray into the wind the drift is approximately 500 ft. ▪ Obtained and outfitted the M/V International Peace for Tier 2 and 3 SMART monitoring and for verifying dispersant effectiveness and evaluating toxicity of applications. ▪ Dispersant targeting of oil was revised to target black and brown oil near the sources rather than the pinkish/reddish more weathered oil near shore. ▪ Aerial dispersant operations shut down due to report of fumes at two Nippon manned platforms.
May 13	▪ In response to report of fumes causing evacuation of two Nippon manned platforms off of SE Pass on May 12th a GIS map was prepared of the aerial dispersant spray sorties showing the location, quantities and start/stop times. This graphic clearly showed that aerial dispersant operations were 50 nm or more from the subject platform and therefore were not the cause of the reported incident.

Date	Dispersant Related Event
	➢ Provided neat boat spraying systems to the M/V Adriatic and Hos Super H for applying dispersant at the source site as directed by Source Control in Houston, TX. Both vessels are under the operational control of Houston Source Control. ➢ Published information alternate dispersant testing and evaluation. Sea Brat #4 recommended from those tested pending analysis of chemical components to ensure there are no issues with endocrine inhibitors. ➢ Area advised if alternate dispersant used there will be a need to re-calibrate and test aerial and boat spray equipment.
May 14	▪ M/V International Peace (IP) outfitted and going to sea to collect water samples for chemical analysis and toxicity testing and conduct SMART Tier 2 fluorometry. ➢ Airborne Support Incorporated (ASI) spray aircraft (BT-67 and DC-3) successfully completed spray equipment calibration testing on 14 May 2010; begin spraying operations on 15 May. ➢ Nalco recalled recent shipment of Corexit 9500 due to higher levels of water in the product which may cause salt formation and clog nozzles. ➢ USAFR AF-105 had dispersant system sump tank leak spilling about 100 gallons of dispersant into the aircraft. No injuries. Cleanup completed with sorbents stationed onsite. - Zone AB closed to allow for Nippon platform monitoring. - Portable GPS unit installed on Lynden aircraft and personnel and procedures developed to obtain exact location of spray on and off
May 15	▪ NOAA SSC advised that dispersant spraying should be limited to seas of 2 feet or greater to ensure sufficient energy for dispersant action. NOAA advised safety setback of 3 nm for marine mammals.
May 16	▪ Met with ISB team to develop a means to de-conflict operations by assigning an area for them to work so that aerial operations can work around them. ▪ Recommend to Area to use one dispersant for subsea injection (Sea Brat #4) and use Corexit 9500 for aerial operations if an alternate dispersant is used. ▪ Enhanced security at Houma and Stennis staging airport.
May 17	▪ Advised may use Sea Brat #4 for aerial application. If so will assign to USAFR aircraft as their system is easier to calibrate. ▪ NOAA SSC established a minimal wave height restriction of 3' for aerial dispersant operations. ▪ Completed and submitted the deepwater sample monitoring plan.
May 18	▪ AT-802 approved for dispersant application out to 10 nm offshore. ▪ Developed a planned spray test using the M/V International Peace and the AT-802 to evaluate dispersant effectiveness in low wave sea states. ▪ Dispersant Assessment Group (DAG) formed to coordinate and communicate dispersant scientific efforts. ▪ 747 proposal to apply dispersant was not accepted as adequate capability was currently in place. ▪ Nalco and BP signed a supply contract yesterday for continued supplies of

Date	Dispersant Related Event
	Corexit 9500. ▪ AT-802 operations commenced at Houma Airport. ▪ BP IC, Planning and Environmental Sections, Aerial Dispersant Group and SSC met and were informed by SSC that a 3 foot sea state was required for dispersant application.
May 19	▪ The M/V IP conducts SMART Tier 3 evaluations and collection samples for chemical analysis and toxicity testing Nalco advises they will reduce their delivery of EC9500A to 10,000-15,000 gallons per day due to shortages in the raw materials dispersant production.
May 20	▪ Recent review of SEA Brat #4 formulation and manufacturing capability indicates that this product may not be appropriate for large scale operations. Alternate dispersants from the NCP are being re-considered. ▪ EPA issued Addendum 2 to its Dispersant Monitoring and Assessment Directive. ▪ Coordinated the hydrocarbon fingerprinting laboratories; evaluated analytical fingerprinting methods and data reporting protocols for the Mobile and Houma tar ball sampling program (RAT/ FRAT).
May 21	▪ AT-802 was approved for near shore operations out to 15 miles offshore by BP Air Operations. ▪ The Aerial Dispersant's Group discussed and obtained resumption of spraying dispersant in zone AB. The Safety Group agreed that dispersants were not the cause of the evacuation and that standard standoff distances from the platforms were appropriate, especially with the reports of dispersible oil moving into this area. ▪ Permission was granted this morning by Unified Command to apply aerial dispersants at 2' wave height. ▪ Aerial Dispersant Group prepared a report entitled, "*Criteria for Conduct of Aerial Dispersant Operations MC 252 Response,"* evaluating the use of dispersants in low sea states. The report and recommendation to use dispersants in 0.5 to 1.0 sea states was submitted to the NOAA SSC for reconsideration of the 3 foot requirement. ▪ Due to Nalco dispersant supply issues and the need to supply subsea and VOC spraying operations, Aerial Dispersant Group has been instructed to disperse no more than 25,000 gallons daily. ▪ Developing process to acquire pure Corexit 9500 and 9527 samples to handle requests for dispersant product samples from a variety of agencies. ▪ Procured GPS referenced cameras for all spotter aircraft to photograph slicks.
May 22	▪ EPA Region VI and NOAA to inform the Unified Command concerning the use of preliminary SMART fluorometry data which has not been vetted or quality reviewed. The use of raw data should not be used in decision making on dispersant effectiveness as it could lead to incorrect conclusions. Issues related to attenuation of reading and instrument sensitivity settings need to be made consistent for proper interpretation. ▪ Responded to request by RRT VI members to receive weekly summary of dispersant operations. ▪ Acquired two MetOcean GPS tracker buoys for use on the M/V International Peace to assist in fluorometer tracks measuring oil dispersibility.

Date	Dispersant Related Event
May 23	▪ Submitted request to UC to stand-down the USAFR assets as commercial spray aircraft are available. ▪ In response to an EPA request, a description of the dispersant spray operations conducted on May 22, 2010 was prepared. A short description of the targeting of the oil slicks was provided, photographs of the spill size and a figure showing the GIS referenced spray passes was provided. ▪ A request to Operations has been made to maintain skimming vessels within the 5 nm setback radius around the source site. Today skimming vessels followed the oil beyond this setback which prevented dispersant from being applied due to the 2 nm safety setback from vessels. ▪ Held initial meeting on SMART on project to organize, consolidate, conduct QA/QC, and deliver data sets to NOAA.
May 24	▪ Convened the Dispersant Science Support Committee. Conducted aerial spray test of dispersants in 0.5 to 1 foot wave heights to determine if waves of this height have sufficient energy for effective dispersant action. Operation showed successful dispersant action.
May 25	▪ Executed dispersant spray tests with the International Peace and King Air spray aircraft to assess if 0.5 to 1.0 waves can provide sufficient energy for dispersant action.
May 26	▪ Members of the Dispersant Group attended the joint RRT VI and IV meeting in Baton Rouge to discuss the dispersant operations and the sampling and analysis plans. ▪ The setback around the source site for dispersant spray operations has been reset to 5 nm radius to allow skimming vessels good access to the fresh oil in this area and allow aerial application of dispersants to treat those slicks traveling toward sore. ▪ Received report of dispersant overspray of a fishing vessel. This report was proven fallacious as the vessel was 47 nm miles from the single spray mission conducted. ▪ Aerial Dispersant Science team attended RRT 4 and 6 Deepwater Horizon Dispersants Meeting in Baton Rouge, LA on May 26-27, 2010.
May 27	▪ Received notification that EPA issued on 26 May Addendum 3 to its Dispersant Monitoring and Assessment Directive which states **"BP shall eliminate the surface application of dispersants."** ▪ Members of the Dispersant Group attended the joint RRT VI and IV meeting in Baton Rouge to discuss the dispersant operations and the sampling and analysis plans. ▪ One reported dispersant overspray of a fishing vessel was reported. This report was proven fallacious as the vessel was 47 nm miles from the single spray mission which applied 229 gallons of Corexit 9500 at position 28°-55.0' N and 88^{o-}49.9' W.

Date	Dispersant Related Event
May 28	▪ Received guidance from Robert Command Center concerning the new requirements for approval of dispersant operations by Area Command. For next day operations justification must be provided to the FOSC, RADM Landry which includes: ➢ Volume, weather conditions, and evaluation that mechanical recovery and ISB were considered and the reason they would not be used. ➢ Based on this direction the initial request covering the above criteria was submitted to apply dispersant to a large oil slick which was observed off of the Louisiana delta area. The request was approved by the FOSC, RADM Landry for dispersant application not to exceed 15,000 gallons. The actual amount sprayed was 10,259 gallons of Corexit 9500. The reduced amount was due in part to the sighting of dolphins in the spill area and creating a 3 nm offset to ensure they were protected. ▪ Received RADM Landry's approval of Letter of Release for DOD C-130 MASS aircraft. Transition plan to commercial assets will be finalized and submitted for approval to UC to ensure no reduction in dispersant capability and sufficient overlap for dispersant mission familiarization. ▪ SINTEF scientists from Norway arrived in Houma and began developing a field work plan to test the dispersibility of MC252 oil in various states of weathering. ▪ Prepared dispersant spray request to conduct dispersant boat spraying tests on fresh and emulsified oil. These tests are necessary to determine dispersant effectiveness and to obtain water samples for chemical and toxicological analysis. This sampling is required for assessing the extent and duration of dispersant plumes that are created from the surface applications.
May 29	▪ Spraying was not conducted today due to report by a fishing vessel that a spray aircraft passed close to them with no spray coming from the plane. The aircraft flight records were reviewed and the pilots of the spray and spotter aircraft met to discuss the report. The USAFR operators responded that they observed the vessel on the aircraft's radar and turned off spraying outside of 4 nm from the vessel. They then turned and passed 2 nm from the vessel. This operation was confirmed by both the spotter aircraft and the second USAFR aircraft that was holding at altitude. All pilots continue to observe the 2 nm setback from vessels and platforms and fly safely while completing low level application of dispersants. ▪ A Hurricane Plan was prepared for the Stennis and Houma aerial dispersant bases and for each aircraft company for relocating dispersant aircraft, personnel and dispersant stockpiles.
May 30	▪ Completed restructuring of command center to consolidate all operations in a single room resulting in improved communication and coordination

Date	Dispersant Related Event
May 31	▪ Aerial dispersant spray operations today, May 31, were terminated early due to a report of some platform personnel becoming ill. The platform was located approximately 70 nm from the dispersant application taking place on this day. ▪ Applied Science Associates requested that the Dispersant Group assist with their vessel to acquire dispersed oil samples. A meeting was held to discuss the safety, communications and operational procedures that will be used. If dispersant approval is granted tomorrow a spotter aircraft will work the NRDA vessel to locate a suitable slick and the Houma based DC-3 will apply the dispersant. ▪ A Declaration of dispersant operations procedures and the location of spray aircraft on May 28, 2010 was prepared by BP outside counsel. This activity is in response to legal actions taken by a fisherman who was allegedly injured by dispersant during response operations.
June 1	▪ Unified Command requested an historical summary of the previous five (5) days of dispersant application activities and analysis. ▪ BP IC advised that dispersants would not be applied today.
June 2	▪ M/V Warrior SMART mission and the M/V Bunny Bodelon NRDA mission were canceled this date due to not receiving approval to apply dispersants. ▪ Aerial Dispersants Group spotter crews identified oil throughout the area early this morning, and delivered comprehensive reports to the Incident Command. The reports were sent to the Situation Unit for reassignment when the request for dispersant application was not received. ▪ Lynden Air Cargo advised they are loading the Alyeska ADDS Pack and departed en route to Gulfport-Biloxi airport for pre-staging to arrive this evening.
June 3	▪ The OSR aircraft arrived at Gulfport-Biloxi International Airport ▪ The Aerial Dispersants Group provided spotter aircraft and shoreside support to the M/V Mr. Joe which is on a scientific data collection mission to determine effectiveness on emulsions for near shore protection. No approval to spray dispersants was received.
June 4	▪ USAF departed Stennis International Airport the morning of June 4, 2010, after 35 days of dispersant operations. The USAF have been replaced by the Lynden C-130 with an Alyeska ADDS Pack and OSR C-130 with an ADDS Pack. This will increase overall dispersant application capability to approximately a maximum of 100,000 gallons per day. ▪ The Lynden second C-130 aircraft arrived at Stennis International Airport.
June 5	▪ An orientation mission was planned for execution tomorrow to provide the new Lynden & OSR personnel located at Stennis the opportunity to become familiar with the operation. ▪ Orientation, training, calibration of spray equipment conducted with OSR and Lynden crews.
June 7	▪ New approval procedures have been requested by Area Command that need to be included in our daily dispersant request. ▪ A 16x14 mile exclusion zone or box was agreed upon between dispersant and controlled burn teams for today's operations. Continue to work de-confliction issues.
June 8	▪ The M/V International Peace was transferred to the Dispersants Group to

Date	Dispersant Related Event
	serve as a research vessel for water sampling for future aerial dispersant applications as required by Robert Area Command. The Mission statement and ICS-204 has been finalized.
June 9	▪ Ed Levine (NOAA SSC) clarified the RRT position regarding SMART as follows: "The agreement was to do Tier 1 and the traditional Tier 2/3 monitoring until the M/V International Peace could go out and then switch to just Tier 1 and the M/V International Peace."
June 10	▪ New aerial dispersant approval process was instituted on June 10 and was successful in obtaining FOSC approval to apply 15,700 gallons by 0830 local. This early approval permitted spotters to relocate and direct aircraft to primary dispersible oil target. ▪ Commenced new air traffic control procedures for obtaining discreet IFF codes for the TFR. Pilots must call Air Ops to obtain codes prior to first flight of the day. ▪ The AT-802 spray operations have been authorized to apply dispersants out to 30 miles from shore.
June 11	▪ A request was provided to the Houma Unified Command for the M/V *International Peace* to be permitted to spray dispersant with its boat spray application system on targeted oil slicks for toxicity testing and effectiveness on emulsified oil. ▪ Provided information to Mobile Command Center Planning Section concerning the development of a dispersant application plan.
June 12	▪ Attended meeting with Robert Command Center personnel and Aerial Dispersant and SMART personnel from Houma. EPA stated clearly that the current policy is that surface application of dispersant should be eliminated. The process of obtaining approval to spray is on an exception basis. SMART Tier 1 reports would have preliminary assessments included in the daily Aerial Dispersant Operations - Houma Status Report. Full Tier 1 SMART reports as prepared by the NOAA/EPA Data Management Group with annotated photos will follow within 48 hours.
June 13	▪ BT-67 Aircraft experienced a lam (Cam) Lock failure on the high pressure side of the spray pump while completing their spray mission at 12:39 this day. The failure of the cam lock caused a release of approximately 20 gallons of Corexit EC9500A into the aircraft. ▪ The SMART Team, Environmental Section, SSC and GIS coordinator prepared procedures to document SMART Tier 1 (visual observations) reports. The procedures will record the observations and photographs on standard forms, evaluate the data as to the effectiveness of the dispersant and file the data at a computer site available to all responders.
June 15	▪ Aerial Dispersants Group – Houma now has an EPA Liaison for dispersant operations embedded into the group. ▪ Two EPA observers will be joining the crew replacing the USCG SMART observers on the M/V International Peace.

Date	Dispersant Related Event
June 16	▪ May 5-19, 2010, Dispersant Assessment Group Cruise Report was released. This project was designed to test the performance and effectiveness of three chemical dispersants on the MC252 crude oil using on-water boat spray field tests near the spill source using visual and chemical monitoring procedures. ▪ Rear Admiral James Watson, FOSC, granted approval to the Aerial Dispersant Group – Houma's request for continuous boat spray operations on June 14, 2010. This approval allows the M/V International Peace to use their boat spray system in volumes of 50 gallons per test for a total not to exceed 500 gallons of dispersant EC9500A for a period not to exceed 14 days to conduct additional sampling of dispersed oil and for toxicity testing.
June 17	▪ Conducted Spotter training for Houma and SMART Tier 1 personnel at the Houma Air base. The NOAA SSC, Dispersant Operations, SMART Coordinators, and Environmental Group leaders also presented and discussed the current SMART Tier 1 reports and QA/QC procedures. ▪ NIOSH has requested that a representative sail on the M/V International Peace to conduct monitoring of dispersant exposure during boat spray and aerial spray operations. ▪ Communications between Surface-to-Air on the M/V International Peace was greatly improved with the new radio air band base station.
June 18	▪ Developed Aerial Dispersant Application Versus Shoreline Impact Graph to showing the amounts of dispersant applied versus the miles of shoreline oiled.
June 19	▪ Questions about RRT 4 approval to spray dispersants within Region IV waters were identified. This question was brought forward to the FOSC and it was learned that RADM Watson had already addressed this concern and dispersant spraying was approved for both Region IV and VI waters. ▪ A request was made to the UC to improve the safe air operations by revising the current dispersant approval process and structure aircraft departures to better operate in the current period of offshore thunderstorms.
June 20	▪ A NIOSH representative is on board the M/V IP to continue conducting additional human health monitoring. ▪ Dispersant approval changes to allow an initial 5,000 g of spraying in the morning has improved operational flow and reduced risk of accidents.
June 21	▪ The Dispersant Group prepared a memorandum to the UC requesting that dispersant preapproval procedures be restored to the Unified Command (UC) in Houma, LA to manage the aerial and boat spray application of dispersants on surface oil. This request for approval modification was made so that surface dispersant use can remain a viable operational tool for responding to the Deepwater Horizon incident.

Date	Dispersant Related Event
June 22	▪ In response to allegations about the emergency discharge of Corexit 9500 by the DC-3 on April 29th into the western reach of Barataria Bay affecting the bays oysters, a sampling and analysis plan was prepared and samples taken. ▪ Arrangements have been instituted to complete the QA/QC reviews of the fluorometry data taken by the M/V International Peace. The procedures are for the M/V IP to send their raw data to Houma Command Center EPA Environmental Technical consultants who prepare the material in a poster template format. Then it is QA/QC'ed and all of the information is then uploaded to the EPAOCS.net web site. The QA/QC form is being developed and will be used soon.
June 24	▪ NIOSH report on BP Health Hazard Evaluation was published today. Recommendations for boat spray to protect workers were made and implemented. All monitoring levels on M/V IP and Warrior were below exposure limits. ▪ BP Aviation has authorized the AT-802 spray aircraft to spray dispersant out to 40 nm offshore. Air Operations are trying to track all aircraft on a single screen in the air operations center. The system they have chosen is an tracking system used by ERA Helicopters LLC in their helicopters.
June 25	▪ The 24 June report of spraying within 1 mile of a skimming vessel was investigated. It was found that no spraying was conducted closer than 4.5 miles from the vessel's position. However, the aircraft while en route to the spray site did pass about 1.5 miles from the vessel. The report of spraying was incorrect and most likely the vessel saw the engine exhaust which is considerable from a C-130. This information was passed back to the F/V Bumble Bee who is the command vessel for the non-source skimming group.
June 26	▪ Houma Dispersant Assessment Group leader, attended a workshop commissioned by the US Surgeon General to "Assessing the Human Health Effects of the Gulf of Mexico Oil Spill: An Institute of Medicine Workshop" on June 22-23, 2010 in New Orleans, LA.
June 29	▪ Authorization was given by the BP Incident Commander, Keith Seilhan, to add two additional AT-802s and two boat systems to the dispersant assets to provide greater flexibility in responding to near shore slicks and to be better prepared during the hurricane season. ▪ The summary of the dispersant approvals since issuance of Addendum 3 Dispersant Monitoring and Assessment Directive was updated, reformatted and new information added to make it a more useful too. ▪ Informed by Nalco that they had received a purchase order for 300,000 gallons of Corexit 9500.
July 1	▪ In response to requests about the dispersant approval process for compliance with EPA Directive Addendum 3 we have prepared process flow charts for the RRT 6 pre-approval aerial dispersant spray procedure which was used prior to May 26 and the Addendum 3 procedure used after May 26 which seeks to eliminate the application of dispersants by air and boat spray systems.
July 2	▪ Received results of sampling from emergency discharge of dispersant into Barataria Bay. All samples showed no Corexit 9500A present. ▪ Air operations shifted to Tyndall AFB.

Date	Dispersant Related Event
July 9	▪ Prepared a flow chart of the aerial dispersant operations for decision makers to easily understand the process of how dispersants are applied and all of the information that is needed. ▪ Developed a database of all spray missions, specifically targeting all missions that were conducted within 10 - 20 nm from shorelines at the request of BP Corporate. ➢ 2.07% of total spray volume (975,058 gallons) was within 10 nm from shore. ➢ 7.79% of total spray volume (975,058 gallons) was within 10 to 20nm from shore.
July 11	▪ Aerial Dispersant Group Houma prepared a briefing paper and presented a briefing on the dispersant operations and a tour of the ASI and AT-802 spray assets and participated in an over flight tour of the source site and offshore areas for USCG and USEPA HQ / Region VI personnel.
July 12	▪ The FOSC, RADM Watson, delegated aerial dispersant application approval authority for up to 10,000 gallons a day to FOSCR, ICP Houma in a memorandum dated 11 July 2010.
July 15	▪ The request requirements for approval to spray dispersants was modified again this day. ▪ Houma Unified Command directed the Aerial Dispersants Group to demobilize three (3) C-130 spray planes (1 OSR and 2 Lynden) from the Stennis airport staging base along with the associated ADDS packs used for spraying.
July 16	▪ The request requirements for approval to spray dispersants was again modified - there is no longer an evening pre-approval request for the next morning. All requests will be based on sighting specifics. ▪ Later this same day, at approximately 1730, we were advised by Capt. Laferriere that another revision to the new dispersant approval procedure was that all requests for dispersant use MUST be submitted no later than 1500 each day. This restriction limits the Aerial Dispersant Group to only those oil slicks discovered during the morning reconnaissance flights as candidates for spray missions. ▪ One (1) DC-3 spray plane was removed from its standby status at the Houma airport staging base. ▪ NOAA personnel (10) toured the Houma airbase this day visiting the ASI facility and BT-67, AT-802 spray aircraft and the reconnaissance aircraft.
July 18	▪ Aerial Dispersants group in coordination with Air Operations and Offshore Operations Section have recommended the demobilization of all but six airplanes in the dispersant operations assets. This recommendation is being evaluated by UC.
July 19	▪ Last application of dispersants made to an oil slick.
July 20	▪ The M/V Determination is in the process of demobilization. ▪ Briefed visiting international VIP Observers on aerial dispersant operations and provided 30 page handout of materials. ▪ All three AT-802s departed Houma this day.
July 23	▪ Demobilization of aircraft (King Air's and IAR C-130 at Stennis) was approved and processed. ▪ Preparations made for tropical storm Bonnie.
August 27	▪ Activated at 1430 local time on August 27th the ASI BT-67 and Aero

Date	Dispersant Related Event
	Commander and the Dynamic Aviation King Air to be ready for the replacement of the BOP.
September 4	▪ Termination of aerial dispersant operations. With the successful replacement of the BOP, the UC demobilized the ASI BT-67 and Aero Commander and the Dynamic Aviation King Air and associated pilots.
September 5	▪ Aerial Dispersant Group demobilized and all aerial dispersant personnel and resources demobilized.
September 19	▪ BP confirmed that well kill operations on the MC252 well in the Gulf of Mexico are now complete, with both the casing and annulus of the well sealed by cement.

7. OVERVIEW OF DISPERSANT OPERATIONS

Dispersant DAILY Application Totals

Dispersant Statistics Applied by Day						
Date	**Dispersant Type (gallons)**		**Daily Totals**	**# Sorties**	**Acres Covered** (5 gal/acre application rate)	**Square Miles covered**
	9500	**9527**				
21 April 2010	Initial Response Date					
22 April 2010	0	1,880	1,880	1	376	0.6
23 April 2010	0	0	0	0	0	0
24 April 2010	0	0	0	0	0	0
25 April 2010	0	11,604	11,604	9	2,321	3.7
26 April 2010	0	14,486	14,486	10	2,897	4.5
27 April 2010	11,191	15,887	27,078	11	5,416	8.5
28 April 2010	27,269	14,874	42,143	15	8,429	13.2
29 April 2010	37,098	4,000	41,098	13	8,220	12.9
30 April 2010	4,900	0	4,900	1	980	1.5
1 May 2010	3,550	8,103	11,653	4	2,331	3.6
2 May 2010	0	0	0	0	0	0
3 May 2010	0	0	0	0	0	0
4 May 2010	10,561	23,712	34,273	12	6,855	10.7
5 May 2010	30,955	18,690	49,645	18	9,929	15.5
6 May 2010	13,032	15,738	28,770	11	5,754	9.0
7 May 2010	5,582	1,688	7,270	4	1,454	2.3
8 May 2010	17,813	23,877	41,690	17	8,338	13.0
9 May 2010	29,034	26,898	55,932	21	11,186	17.5
10 May 2010	29,240	26,980	56,220	22	11,244	17.6
11 May 2010	7,940	0	7,940	2	1,588	2.5
12 May 2010	39,710	0	39,710	12	7,942	12.4
13 May 2010	41,620	0	41,620	15	8,324	13.0
14 May 2010	44,031	0	44,031	14	8,806	13.8
15 May 2010	14,208	0	14,208	6	2,842	4.4
16 May 2010	0	0	0	0	0	0
17 May 2010	6,591	0	6,591	3	1,318	2.1

Dispersant Statistics Applied by Day						
Date	**Dispersant Type (gallons)**		**Daily Totals**	**# Sorties**	**Acres Covered** (5 gal/acre application rate)	**Square Miles covered**
	9500	**9527**				
18 May 2010	209	0	209	1	42	0.1
19 May 2010	0	0	0	0	0	0
20 May 2010	0	0	0	0	0	0
21 May 2010	24,233	4,659	28,892	14	5,778	9.0
22 May 2010	48,653	1,593	50,246	22	10,049	15.8
23 May 2010	18,104	0	18,104	11	3,621	5.7
24 May 2010	638	0	638	1	128	0.2
25 May 2010	200	0	200	1	40	0.1
26 May 2010	229	0	229	1	46	0.1
27 May 2010	200	0	200	1	40	0.1
28 May 2010	10,259	0	10,259	4	2,052	3.2
29 May 2010	0	0	0	0	0	0
30 May 2010	15,131	0	15,131	6	3,026	4.7
31 May 2010	11,676	0	11,676	7	2,335	3.7
1 June 2010	0	0	0	0	0	0
2 June 2010	0	0	0	0	0	0
3 June 2010	1,900	0	1,900	1	380	0.6
4 June 2010	0	0	0	0	0	0
5 June 2010	125	0	125	1	25	0
6 June 2010	0	0	0	0	0	0
7 June 2010	3,998	0	3,998	2	800	1.3
8 June 2010	5,505	0	5,505	3	1,101	1.7
9 June 2010	0	0	0	0	0	0
10 June 2010	4,506	0	4,506	2	901	1.4
11 June 2010	14,305	0	14,305	6	2,861	4.5
12 June 2010	6,996	0	6,996	2	1,399	2.2
13 June 2010	35,212	0	35,212	13	7,042	11.0
14 June 2010	10,706	0	10,706	7	2,141	3.3
15 June 2010	2,608	0	2,608	3	522	0.8
16 June 2010	13,380	0	13,380	7	2,676	4.2

Dispersant Statistics Applied by Day						
Date	**Dispersant Type (gallons)**		**Daily Totals**	**# Sorties**	**Acres Covered** (5 gal/acre application rate)	**Square Miles covered**
	9500	**9527**				
17 June 2010	12,123	0	12,123	6	2,425	3.8
18 June 2010	15,564	0	15,564	8	3,113	4.9
19 June 2010	2,604	0	2,604	2	521	0.8
20 June 2010	15,403	0	15,403	6	3,081	4.8
21 June 2010	10,355	0	10,355	4	2,071	3.2
22 June 2010	2,008	0	2,008	2	402	0.6
23 June 2010	5,099	0	5,099	3	1,020	1.6
24 June 2010	21,088	0	21,088	10	4,218	6.6
25 June 2010	4,633	0	4,633	2	927	1.5
26 June 2010	23,022	0	23,022	12	4,605	7.2
27 June 2010	6,623	0	6,623	3	1325	2.07
28 June 2010	0	0	0	0	0	0
29 June 2010	0	0	0	0	0	0
30 June 2010	0	0	0	0	0	0
01 July 2010	17,852	0	17,852	5	3570	6
02 July 2010	12,737	0	12,737	7	2547	4
03 July 2010	0	0	0	0	0	0
04 July 2010	3,000	0	3,000	1	600	1
05 July 2010	803	0	803	1	161	.25
06 July 2010	0	0	0	0	0	0
07 July 2010	1,000	0	1,000	1	200	0.3
08 July 2010	0	0	0	0	0	0
09 July 2010	0	0	0	0	0	0
10 July 2010	0	0	0	0	0	0
11 July 2010	0	0	0	0	0	0
12 July 2010	0	0	0	0	0	0
13 July 2010	999	0	999	1	200	0.3
14 July 2010	0	0	0	0	0	0
15 July 2010	0	0	0	0	0	0
16 July 2010	0	0	0	0	0	0

Dispersant Statistics Applied by Day						
Date	**Dispersant Type (gallons)**		**Daily Totals**	**# Sorties**	**Acres Covered** (5 gal/acre application rate)	**Square Miles covered**
	9500	**9527**				
17 July 2010	0	0	0	0	0	0
18 July 2010	0	0	0	0	0	0
19 July 2010	200	0	200	1	40	0.1
20 July 2010	0	0	0	0	0	0
21 July 2010	0	0	0	0	0	0
22 July 2010	0	0	0	0	0	0
23 July 2010	0	0	0	0	0	0
24 July 2010	0	0	0	0	0	0
25 July 2010	0	0	0	0	0	0
26 July 2010	0	0	0	0	0	0
27 July 2010	0	0	0	0	0	0
28 July 2010	0	0	0	0	0	0
29 July 2010	0	0	0	0	0	0
30 July 2010	0	0	0	0	0	0
31 July 2010	0	0	0	0	0	0
1 Aug 2010	0	0	0	0	0	0
2 Aug 2010	0	0	0	0	0	0
3 Aug 2010	0	0	0	0	0	0
4 Aug 2010	0	0	0	0	0	0
5 Aug 2010	0	0	0	0	0	0
6 Aug 2010	0	0	0	0	0	0
7 Aug 2010	0	0	0	0	0	0
TOTALS	**758,211**	**214,669**	**972,880**	**412**	**194,581**	**305.0**

QUANTITY OF DISPERSANT SPRAYED BY EACH AIRCRAFT

Aircraft	Tail Number	Operator	Payload	Corexit 9500 Sprayed (gallons)	Corexit 9527 Sprayed (gallons)	Total Dispersant Sprayed (gallons)
C-130	N117TG	IAR	3,250	167,403	77,470	244,873
C-130	N403LC	Lynden	5,000	236,786	99,470	336,256
C-130	N401LC	Lynden	5,000	23,537	0	23,537
C-130	JIV	OSR	5,000	35,379	0	35,379
C-130	105	USAFR	2,000	67,184	0	67,184
C-130	106	USAFR	2,000	30,359	1,593	31,952
C-130	107	USAFR	2,000	40,143	0	40,143
C-130	108	USAFR	2,000	16,269	0	16,269
BT-67	N932H	ASI	1,800	97,871	24,680	122,551
DC-3	N64766	ASI	1,000	28,658	3,000	31,658
DC-3	N64767	ASI	1,000	0	7,100	7,100
AT-802	N9002K	Lane	800	13,868	0	13,868
BE-90	N7198Y	Dynamic	425	554	1,356	1,910
BE-90	N7199D	Dynamic	425	200	0	200
				758,211	**214,669**	**972,880**

<u>Any Extenuating Circumstances Affecting the Deployment of Any Element (Spotters, Dispersant, SMART, etc.)</u>

1. EPA MAY 26 ADDENDUM 3 TO MAY 10 DISPERSANT DIRECTIVE

On May 26, 2010, the EPA issued Addendum 3 to its May 10, 2010 Dispersant Monitoring and Assessment Directive for Subsurface Dispersant Application ("Addendum 3"), shown in Figure 9, requiring BP to "*eliminate the surface application of dispersants*." At the time the May 26th Addendum was issued the well continued unrestricted flow and large surface slicks covering square miles of ocean were observed daily (see photograph below).

Figure 9

May 26, 2010

Dispersant Monitoring and Assessment Directive - Addendum 3

Reduction in Use of Dispersants. BP shall implement measures to limit the total amount of surface and subsurface dispersant applied each day to the minimum amount possible. BP shall establish an overall goal of reducing dispersant application by 75% from the maximum daily amount used as follows:

a. Surface Application. BP shall eliminate the surface application of dispersants. In rare cases when there may have to be an exemption, BP must make a request in writing to the FOSC providing justification which will include the volume, weather conditions, mechanical or means for removal that were considered and the reason they were not used, and other relevant information to justify the use of surface application. The FOSC must approve the request and volume of dispersant prior to initiating surface application.

b. Subsurface Application. BP shall be limited to a maximum subsurface application of dispersant of not more than 15,000 gallons in a single calendar day.

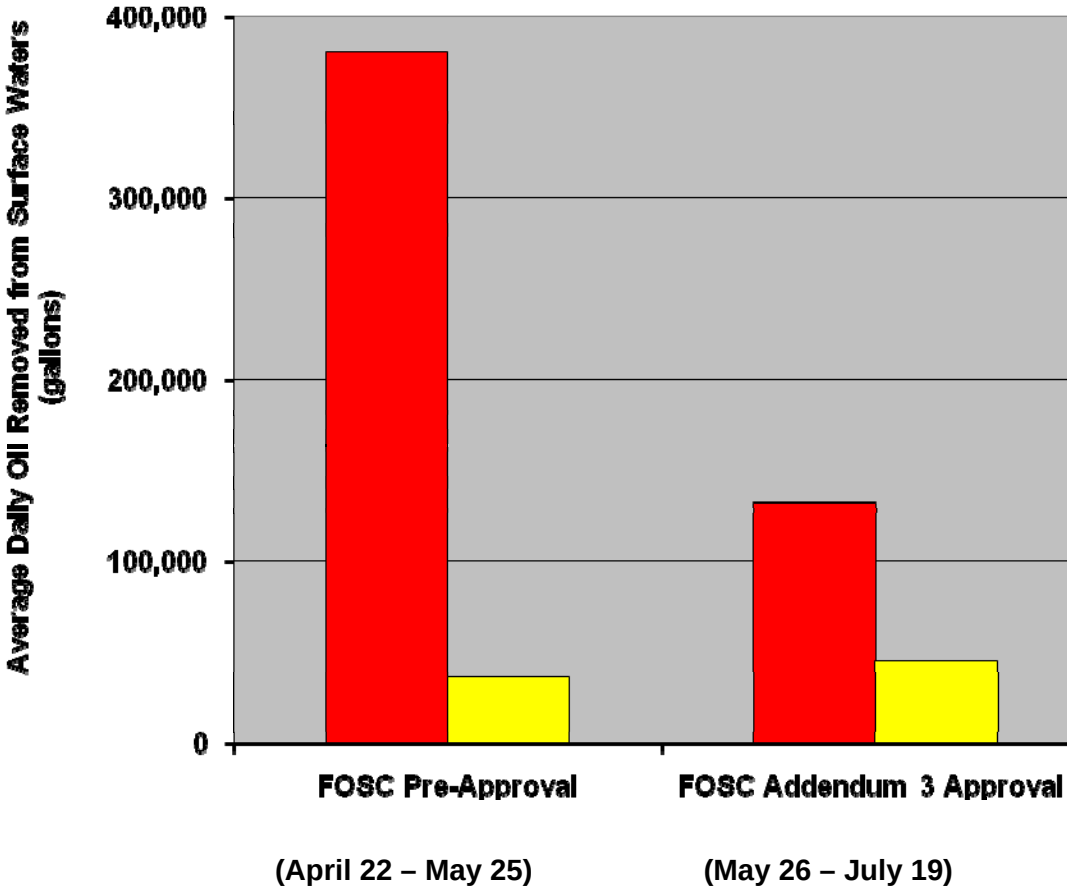
Application of dispersant in amounts greater than specified in this Addendum 3 shall be in such amounts, on such day(s} and for such application (surface or subsurface) only as specifically approved in writing by the USCG Federal On-Scene Coordinator (FOSC).

Although the EPA May 26 Addendum directed BP to eliminate aerial dispersant application, it allowed the FOSC, in rare cases, to approve the use of dispersants if certain conditions were met. Written requests for dispersant use were submitted daily by the Aerial Dispersant Group as prescribed by the UC as oil continued to flow from the well and slicks were identified that often were beyond the recovery capability of skimming and ISB vessels.

Addendum 3 to EPA's Directive resulted in a significant reduction in aerial dispersant application (65%) and a significant reduction in the overall ability to remove surface oil slicks. This overall reduction occurred even with an increase in the number of offshore skimmers. Figure 10 illustrates the potential response differences Addendum 3 created.

Figure 10: Aerial Dispersant and Mechanical Recovery Response Capability Before and After EPA Directive Addendum 3 issued on May 26

Aerial Dispersant ■ vs Mechanical Recovery ■
Estimated Average Daily Surface Oil Removal Surface Water*



***The amount of oil dispersed in depicted in the graph above is based on a Dispersant to Oil Ratio of 1:20, a range of 60-90% effectiveness, and mechanical recovery rate of 10%. The effectiveness and recovery rate percentages used to construct the graph are for illustration purposes only, and should not be used as representations for the specific amounts of oil actually recovered or dispersed. Actual quantities of oil recovered or dispersed depend on a wide range of factors including weather, sea state, transit distance to oil slick, etc.**

As a result of Addendum 3, opportunities for effective aerial application decreased significantly while mechanical recovery daily capability only increased by 21%.

Addendum 3, by minimizing the aerial dispersant response and relying on mechanical recovery, resulted in the increase of oil remaining on the surface. This unrecovered oil most likely found its way to the shores of the Gulf states. Shortly after Addendum 3 the aerial dispersant capability was further increased by replacing USAFR C-130s with 2,000 gallon payloads with commercial C-130s with 5,000 gallon payloads. Thus, the reduction in aerial dispersant use was considerably more than shown in Figure 10 due to this increased capability of up to 100,000 gallons per day.

Although the EPA Directive Addendum 3 required the elimination "of surface application of dispersants," the FOSC could authorize "rare case" exemptions. To address large oil slicks, beyond that appeared to surpass the capacity of the skimming and ISB units, that were observed on a daily basis, the Aerial Dispersant Group submitted written requests to the FOSC to apply dispersants.

After May 26, the RRT pre-approval procedure was replaced by a new procedure intended to better satisfy the requirements of Addendum 3. This new procedure required submitting the following information to the FOSC in writing in order to obtain approval for aerial dispersant application:

1. a report with a map describing the location, size, and coverage of oil slicks found the day before and in the morning of the next day with an analysis of how much dispersant was needed for each slick,
2. a listing of all skimming and ISB assets in the field and an analysis of why, mechanical recovery and ISB assets were unable to recover the slicks identified,
3. trajectory of the oil slicks,
4. weather reports for 3-5 days with information as to when mechanical recovery and ISB may not be operating, and
5. SMART Tier 1 and 2 results from the previous days.

The following two flow charts, Figures 11 and 12, depict the dispersant application procedures before the May 26 Directive and after May 26 until July 15. On July 15 the dispersant approval process was changed to require a request to spray on a slick-by-slick basis, i.e., three oil slicks found during a single surveillance flight would require three separate written requests to spray.

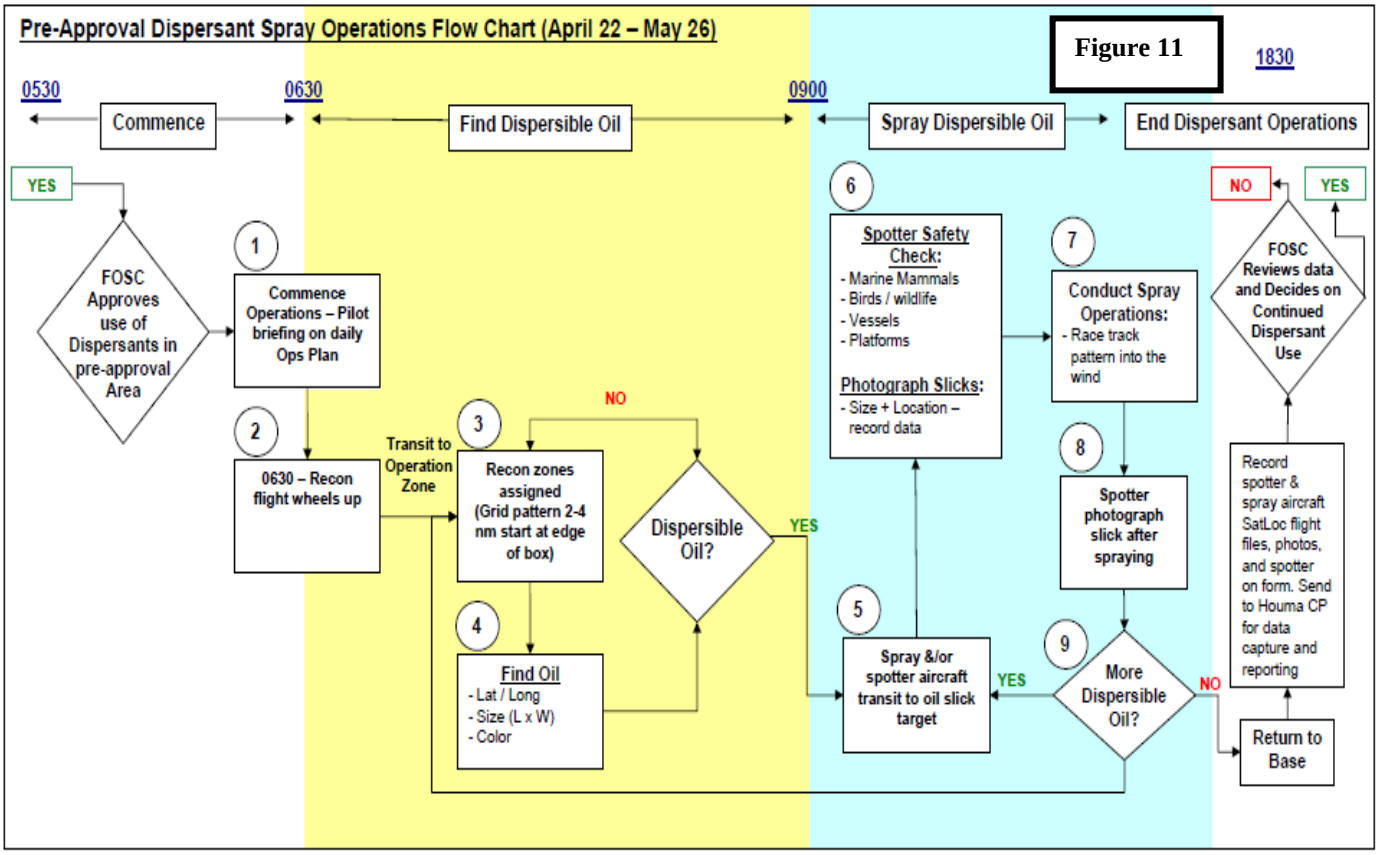
On July 16, the National Incident Commander (NIC) implemented one final change that required dispersant spray requests to be submitted for NIC and EPA Administrator review no later than 1500 each day. This further limited dispersant requests to only those oil slicks observed in the morning because considerable time and effort was required to prepare the information package for each slick for the NIC and EPA review.

The RRT pre-approval process granted to the FOSC as shown in Figure 11 is straight-forward and resulted in the timely application of dispersants to oil slicks. The success of this process lies in early morning approval (earlier than 0700) to allow a full day of operations and in placing the selection of slicks to be sprayed in the hands of the dispersant spotters.

The Addendum 3 procedure, shown in Figure 12, required numerous consultations with EPA and other agencies in order to transmit information to multiple reviewers and to obtain separate agency consents before the FOSC would authorize the aerial dispersant application. This process caused considerable delays in obtaining FOSC approvals and were the cause of reduced dispersant application. Instances of agency computer system malfunctions, office delays in routing information, response emails being identified as junk mail by computer system protocols, and decision makers being unavailable for consultation are just some of the difficulties that were encountered. EPA's decision to embed a representative within the Aerial Dispersant Group to facilitate approvals aided the approval process. However, since that individual did not have the authority to make dispersant decisions it was necessary to consult with EPA Regional/Area offices and EPA Headquarters for the review of each request.

On June 21, after working with the Addendum 3 dispersant request procedures for about a month, the Aerial Dispersant Group requested the FOSC return dispersant approval to the Unified Command (UC) in Houma, LA and return to the pre-approval procedures. The justification for this request is summarized below.

1. National-level review by scientific experts (CRRC Report, Dispersant Use Meeting, Baton Rouge LA May 26-27, 2010) concluded that dispersants are an important component of an effective response and that dispersant use in the DWH response resulted in less environmental harm than not using them.
2. Skimmers and controlled burns cannot remove all of the floating oil from the Deepwater Horizon incident.
3. The response tool with the largest oil encounter rate is aerial application of dispersants. Dispersants applied by aircraft can remove more oil faster from the water surface than mechanical containment/recovery and controlled burns.
4. Training and operational protocols for aerial and boat dispersant spray have been refined to assure optimal targeting and treatment of dispersible oil.
5. SMART (Special Monitoring of Applied Response Technologies) visual (Tier 1), on-water fluorometry (Tier 2), and additional (Tier 3) monitoring demonstrates that dispersant applications are effective at reducing the amount of oil on the water surface, especially fresh black oil.
6. Safety protocols and air monitoring data show that current operational procedures can effectively manage human health risks of exposure to dispersant spray.
7. Preliminary water chemistry and toxicity data on samples collected prior to and following aerial and boat dispersant application to surface slicks indicate that the oil is being dispersed, that measurable levels of oil and dispersant are found in the water column at 1 meter depth but not at 10 meters, and that these levels are not acutely toxic to fish, mysid shrimp, and algae. Additional chemistry and toxicity studies are underway.
8. The use of aerial dispersants on surface slicks in the Deepwater Horizon response is neither excessive nor unique. Dispersant use on the Deepwater Horizon response (application over approx. 266 sq. miles) is commensurate with prior use on well blow outs, i.e., Ixtoc I (1979 in the Gulf of Mexico) and Montara Wellhead Platform (Australia 2009).


Pre-Approval Dispersant Spray Operations Flow Chart (April 22 – May 26)
Figure 11
0530
0630
0900
1830
Commence
Find Dispersible Oil
Spray Dispersible Oil
End Dispersant Operations
YES
FOSC Approves use of Dispersants in pre-approval Area
1
Commence Operations – Pilot briefing on daily Ops Plan
2
0630 – Recon flight wheels up
Transit to Operation Zone
3
Recon zones assigned (Grid pattern 2-4 nm start at edge of box)
NO
Dispersible Oil?
YES
4
Find Oil
- Lat / Long
- Size (L x W)
- Color
5
Spray &/or spotter aircraft transit to oil slick target
6
Spotter Safety Check:
- Marine Mammals
- Birds / wildlife
- Vessels
- Platforms
Photograph Slicks:
- Size + Location – record data
7
Conduct Spray Operations:
- Race track pattern into the wind
8
Spotter photograph slick after spraying
9
More Dispersible Oil?
YES
NO
Return to Base
Record spotter & spray aircraft SatLoc flight files, photos, and spotter on form. Send to Houma CP for data capture and reporting
FOSC Reviews data and Decides on Continued Dispersant Use
NO
YES

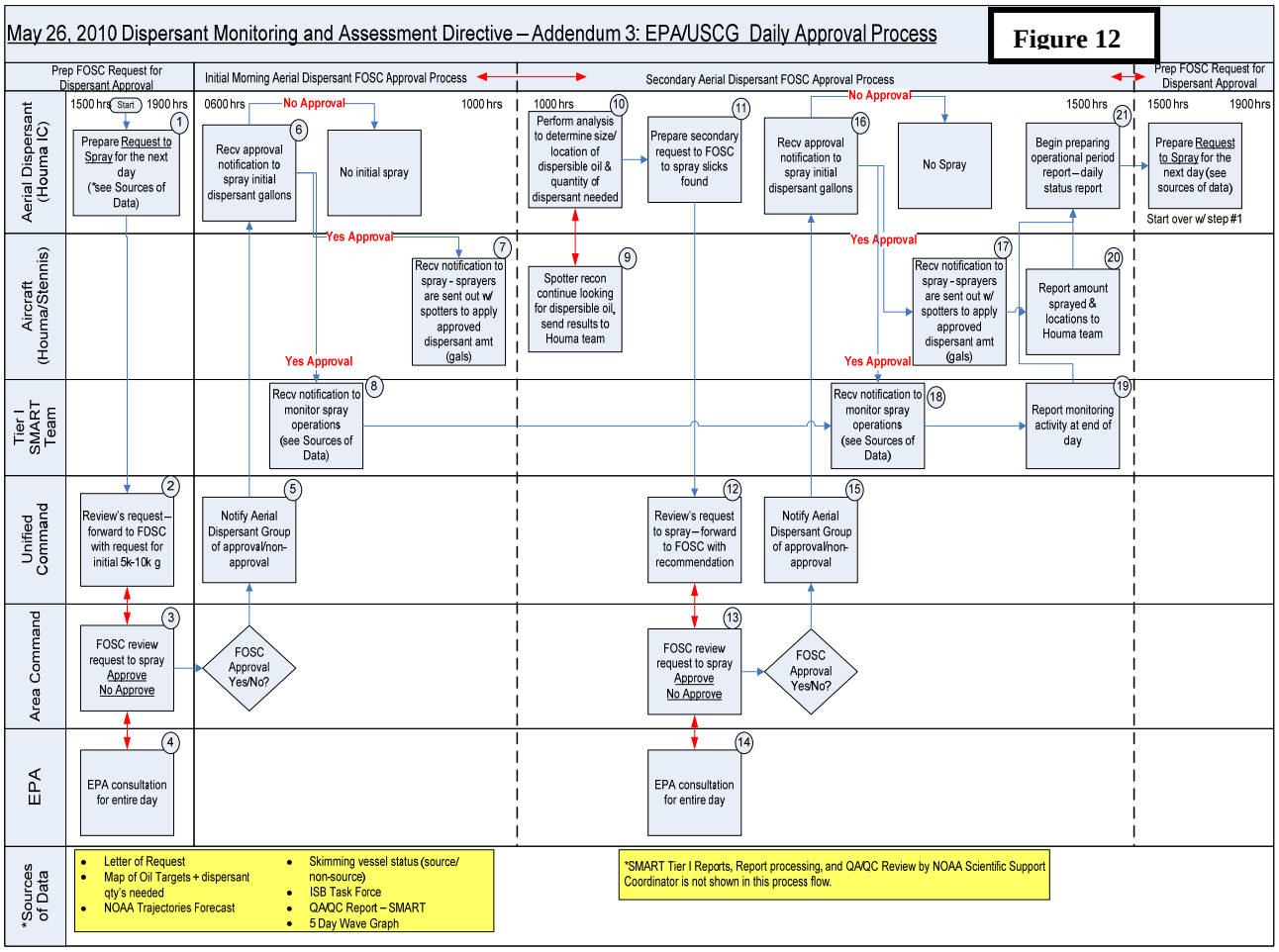

May 26, 2010 Dispersant Monitoring and Assessment Directive – Addendum 3: EPA/USCG Daily Approval Process
Figure 12
Prep FOSC Request for Dispersant Approval
Initial Morning Aerial Dispersant FOSC Approval Process
Secondary Aerial Dispersant FOSC Approval Process
Prep FOSC Request for Dispersant Approval
Aerial Dispersant (Houma IC)
Aircraft (Houma/Stennis)
Tier I SMART Team
Unified Command
Area Command
EPA
*Sources of Data
1500 hrs
Start
1900 hrs
0600 hrs
No Approval
1000 hrs
1500 hrs
1900 hrs
Prepare Request to Spray for the next day (*see Sources of Data)
Recv approval notification to spray initial dispersant gallons
No initial spray
Perform analysis to determine size/ location of dispersible oil & quantity of dispersant needed
Prepare secondary request to FOSC to spray slicks found
Recv approval notification to spray initial dispersant gallons
No Spray
Begin preparing operational period report – daily status report
Prepare Request to Spray for the next day (see sources of data)
Start over w/ step #1
Yes Approval
Recv notification to spray - sprayers are sent out w/ spotters to apply approved dispersant amt (gals)
Spotter recon continue looking for dispersible oil, send results to Houma team
Recv notification to spray - sprayers are sent out w/ spotters to apply approved dispersant amt (gals)
Report amount sprayed & locations to Houma team
Recv notification to monitor spray operations (see Sources of Data)
Report monitoring activity at end of day
Review's request – forward to FOSC with request for initial 5k-10k g
Notify Aerial Dispersant Group of approval/non-approval
Review's request to spray – forward to FOSC with recommendation
FOSC review request to spray Approve No Approve
FOSC Approval Yes/No?
EPA consultation for entire day
Letter of Request
Map of Oil Targets + dispersant qty's needed
NOAA Trajectories Forecast
Skimming vessel status (source/ non-source)
ISB Task Force
QA/QC Report – SMART
5 Day Wave Graph
*SMART Tier I Reports, Report processing, and QA/QC Review by NOAA Scientific Support Coordinator is not shown in this process flow.

Figure 13 provides a summary of the dispersant requests results after Addendum 3 was issued.

Figure 13 Summary of Dispersant Requests and FOSC Approvals (May 26, 2010 - July 19, 2010)

Number of Days (May 26-July 19)	55
Number of Requests Submitted	49
Number of FOSC Approvals	44
Number of days sprayed	32
Number of days spraying approved after 0800 which reduced the amount of dispersants that can be applied	9
Number of days spraying abbreviated due to weather	9
Number of days spraying abbreviated due to skimming/ISB vessel conflicts	5
Average Dispersant Sprayed Per Day Applied (gallons per day)	8,584

Without the dedicated professionals in the Aerial Dispersant Group who prepared the lengthy daily application requests and the FOSCs who approved the requests, the use of aerial dispersant would have been eliminated. Because of the tenacity and dedication of the Aerial Dispersant Group to provide accurate descriptions of field conditions, the FOSCs after May 26 approved a number of written requests, which resulted in spraying 291,849 gallons of dispersant to treat hundreds of thousands of gallons of oil that threatened the shore.

Extenuating Circumstances Affecting the Deployment of SMART

This section describes the Aerial Dispersant Group's comments on the SMART program conducted during the DWH response. The comments are divided into General comments concerning the overall SMART program and into comments specific to Tier 1 and to Tiers 2 and 3 monitoring.

General SMART Comments

Current RRT 6 requirements for dispersant application include a requirement to conduct a SMART mission for each aerial or boat dispersant spray sortie. Once it is established that a dispersant is effective on the type of oil released, continuous SMART monitoring for each aerial dispersant application is not necessary. In the DWH response, the number of spray sorties (reaching up to 20 per day) made it difficult for SMART to monitor each application.

One of the key concepts in SMART is that dispersant monitoring should not interfere or delay spray operations. In DWH, however, unless the spotter and spray planes waited for and guided SMART to the spray location, it was difficult for the SMART assets to arrive onsite in time to observe or monitor the operation. On several occasions coordinating with SMART caused

spray aircraft on site to needlessly circle over the spray target waiting for the SMART helicopter to arrive. This delay reduced what the spray sortie could accomplish and also the number of sorties conducted during the day.

SMART monitoring should be adjusted to reflect spray operations and the spill scenario and should not be automatically required for each spray operation. Close coordination between Houma USCG SMART Coordinators and the Aerial Dispersant Group and close coordination between dispersant spray spotters and SMART observers is necessary to avoid mission delays and permit SMART to be conducted efficiently. Consideration should be given to incorporating SMART personnel into the Aerial Dispersant Group and co-locating observers with spotter aircraft operators in offices at the staging bases. Co-location of SMART was done at the Stennis International Airport staging base and worked well.

Comments on SMART Tier 1

SMART Tier 1 was performed throughout aerial dispersant application missions. SMART Tier 1 missions were conducted via USCG aerial observations from helicopters.

Due to the geographic scope of the spill area and fuel constraints, SMART Tier 1 helicopters could not observe all spray missions (i.e., fuel constraints would require them to return to land base for refueling). A refueling base in closer proximity to the spray missions would have helped to alleviate this issue.

Due to the lateness of some of the spray missions, PHI, the supplier of the SMART helicopters had a not to exceed operational time frame at the end of the day and thus late day spray missions may not have been adequately covered by SMART Tier 1.

Again, due to the immense geographic scope of the spill and spray mission area, consideration should be given to the use of fixed wing aircraft with longer endurance than helicopters for SMART Tier 1 missions. Although fixed wing aircraft have reduced window space for photographing operations, they can stay aloft for 3-4 hours which is essential if the spill were further offshore.

To ensure accurate, consistent and understandable results of observations, a Tier 1 QA/QC form was developed by the Environmental Unit. This form ensured review of the written observations and photographs from the SMART mission were complete, evaluated whether the dispersant was effective, concurred by the NOAA SSC and the mission published as a poster. These posters and the supporting documentation were posted on the US EPA On-Scene Coordinator Website by the SMART Monitoring Group which consisted of NOAA, BP, USCG National Strike Force and EPA Region 6.

Comments on SMART Tier 2 and 3

SMART Tiers 2 & 3 were performed by USCG personnel from the deck of the M/V Warrior. The M/V International Peace was a second platform where SMART 2 & 3 were conducted by OSR, Ltd personnel and contractors in addition to research missions.

The M/V International Peace was a multi-use vessel that performed both research missions for the Aerial Dispersants Assessment Science Group, in conjunction with co-located USCG SMART personnel onboard, who conducted SMART Tiers 2 & 3 observations. This dual use arrangement of the M/V International Peace (IP) was changed in early June when the RRT 6

decided that, “The agreement was to do Tier 1 and the traditional Tier 2/3 monitoring until the IP could go out and then switch to just Tier 1 and the IP.” At that time, in lieu of SMART activities the M/V International Peace began scientific activities following the *"Surface Water Sampling Plan for Dispersant Application Monitoring"*, Version 1, approved on June 3, 2010 by Ron Dippo, Environmental Unit Leader; Mike Utsler, BP IC, Jerome Zeringue, SOSC and Captain Meredith, FOSC.

Difficulties in the coordination of SMART vessel with aerial spray operation and determining the appropriate location to transect the dispersant spray track after the spray mission and doing so in the appropriate time frame to perform SMART Tier 2 and/or 3 due to slow vessel speed coupled with the distance needed to be at least 1 NM distant from aerial spray application.

The early inadequate communications between surface (SMART vessel) and spotter aircraft caused difficulties (e.g., lack of tracking devices on the SMART vessel to determine vessel location and the location of the spotter and spray aircraft).

To ensure accurate, consistent and understandable results, a Tier 2 QA/QC form was developed by the Environmental Unit. This form ensured review of the fluorometry data, written observations and photographs from the SMART mission were evaluated whether the dispersant was effective, evaluation concurred by the NOAA SSC and the mission published as a poster. These posters and the supporting documentation were posted on the US EPA On-Scene Coordinator Website by the SMART Monitoring Group which consisted of NOAA, BP, USCG National Strike Force and EPA Region 6.

The following sections outlined in the RRT 6 After Action Report format are not provided as they will be submitted directly by the SMART team.

- **SMART Data collection issues per USCG**
- **Any Discrepancies Between Estimates**
- **Any Discrepancies Between Observations**
- **Estimates and Observations of Efficacy**

Any Sightings of Pelagic/Migratory Birds, Sea Turtles, or Marine Mammals

Marine mammals, e.g., dolphins & whales, were sighted on numerous occasions throughout the aerial dispersant operational period of the Deepwater Horizon response. The procedure followed by the Aerial Dispersants Group regarding observations of marine mammals, pelagic/migratory birds and sea turtles, consisted of the following:

- Recon/spotter aircraft searched the designated spray location for marine mammals, pelagic/migratory birds and sea turtles prior to conducting spray operations;
- All spray operations were conducted no closer than 3 nm from any observed marine mammal, sea turtle or pelagic/migratory birds; and
- Spray operations that could not be conducted in compliance with the 3 nm separation criteria were cancelled.

During one unique instance after an oil slick had been sprayed, a single whale and then a pod of 4 whales surfaced and swam through the slick. The National Marine Fisheries cetologist was notified of this occurrence. The photographs below show a whale just after swimming through a dispersed oil slick and a whale that approached an OSRV near the source after the well release

was stopped. The dispersant team did not receive any reports of any impacts on whales or other marine mammals due to dispersant or dispersed oil at any time during the response.

Whale Swimming Through Dispersed Oil Slick
(SMART Observer Photograph)

Whale Near OSRV at Source After Release Stopped on July 15

One of the benefits of dispersant use is to reduce the impact of oil on sea birds. Sea birds that feed by diving may not differentiate between an oil slick and clean water. The result is that the bird feathers can become coated with oil while feeding. The plight of one of these sea birds is shown below. Dispersant application by removing the oil from the surface spared many of these birds from similar fates.

Offshore Oiled Bird
(SMART Observer Photograph)

ATTACHMENT 1:
Aerial Dispersant
Lessons Learned, Recommendations and Amplifying Discussion

Lesson Learned #1:

1. The surface application of dispersants was not as fully recognized and accepted by the Regional Response Teams (RRTs) as it should have been -- as one of the primary and preferred response tools for this incident, to minimize damage to sensitive shorelines and wildlife in the projected pathways of oil slicks heading toward shore.

   The vast body of dispersant research, field testing, previous use in spill response and prior federal and state agency approvals should have been sufficient for making strategic decisions for the use of Corexit EC9527A and EC9500A during the MC252 response. The search for alternate dispersants during the response, the changes to the FOSC dispersant approval process and the changes in monitoring requirements were disruptive and hindered the effective use of dispersants to protect sensitive shorelines.

#1 Recommendations

1a. The RRTs should establish as response policy that dispersants are an approved and primary response tool for offshore oil spills, where dispersants are needed to protect vital and sensitive natural resources on and near shore. Dispersant policy should assure that appropriate dispersant resources are optimally deployed to meet response needs during the spill. The RRTs should establish only such criteria for dispersant use as are appropriate for the size, nature, location, and environmental conditions associated with the spill and based upon sound scientific research and data.

1b. Dispersants should be recognized as a first line of defense in appropriate near shore and offshore cases because they can be activated quickly, arrive on scene rapidly, cover significant geographic areas and effectively minimize harm to sensitive natural resources.

1c. Government and industry personnel who are responsible for making decisions about the use of dispersants should be knowledgeable about the body of scientific research and analysis on the subjects of dispersant effectiveness and toxicity, both preceding and following the Deepwater Horizon incident. Research needs should be considered fully before formulating and implementing any new dispersant use criteria, restrictions or prohibitions.

1d. The government's evaluation of the effectiveness and toxicity of individual dispersant products should occur before another spill of national significance occurs. Such evaluations should be based on an objective analysis of the data and at a time when the evaluation will not be subject to sensationalizing media coverage or political pressure associated with a particular incident. Additional research deemed necessary following the Deepwater response should be completed in the near future and the criteria for listing dispersants on the NCP product schedule should be reviewed and revised.

1 Discussion

ATTACHMENT 1:
Aerial Dispersant
Lessons Learned, Recommendations and Amplifying Discussion

RRTs should recognize and approve aerial dispersant operations as a primary and preferred response tool for offshore spills for all potential sources, i.e., platforms, VLCCs and offshore pipelines. Aerial dispersant application is the only response method that can treat large oil slicks quickly over a large operating area and effectively reduce shoreline and marine wildlife impacts.

Ability to Spray Large Oil Slicks over a Large Operating Area

The Deepwater Horizon incident is the largest marine oil spill in history. The Deepwater Horizon sub-sea released approximately hundreds of thousands of gallons of oil for 85 days. This resulted in numerous large oil slicks 5, 10, or 20 nm long and 0.5 to 2 nm wide each containing 100,000 gallons or more of oil.

Large oil slicks ranged from 3 nm to 80 nm offshore and were spread over a 18,000 square mile operational area with oil slicks nearing environmental sensitive areas Grand Isle and the Chandeleur Islands. The following photograph taken by Ocean Imaging from an altitude of 12,000 feet on July 15 shows the magnitude and coverage of one oil slick. This photo was taken just before the flow of oil was stopped at the source. Throughout the response slicks of this size and larger were numerous and spread miles apart across the operating area. The red circle highlights a vessel the size of a large OSRV traveling through the slick. The vessel's wake provides an indication of the swath width of the vessel. The image provides an indication of the difficulty the OSRV would have in recovering this slick when traveling at a speed of 0.5 knots.

ATTACHMENT 1:
Aerial Dispersant
Lessons Learned, Recommendations and Amplifying Discussion

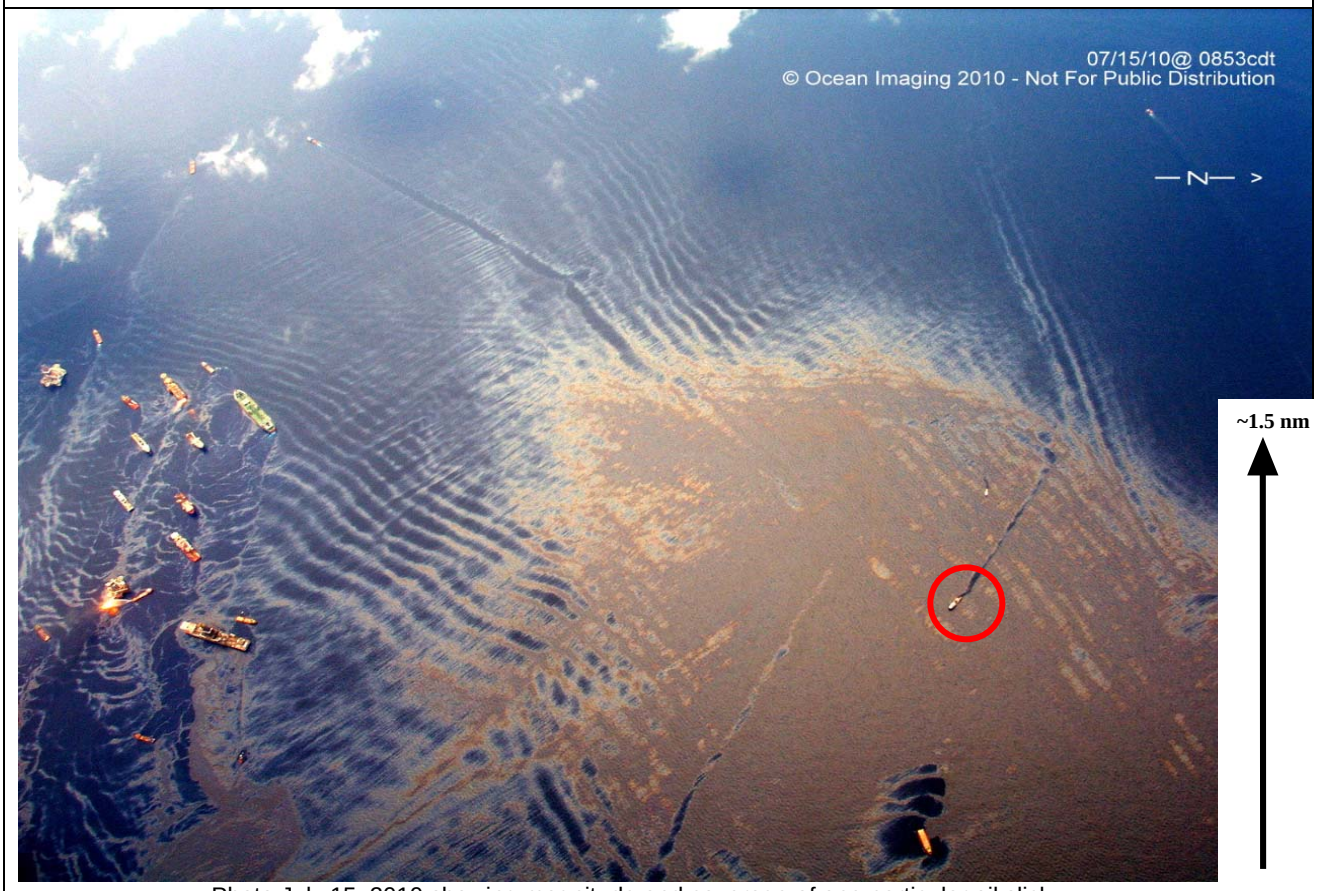
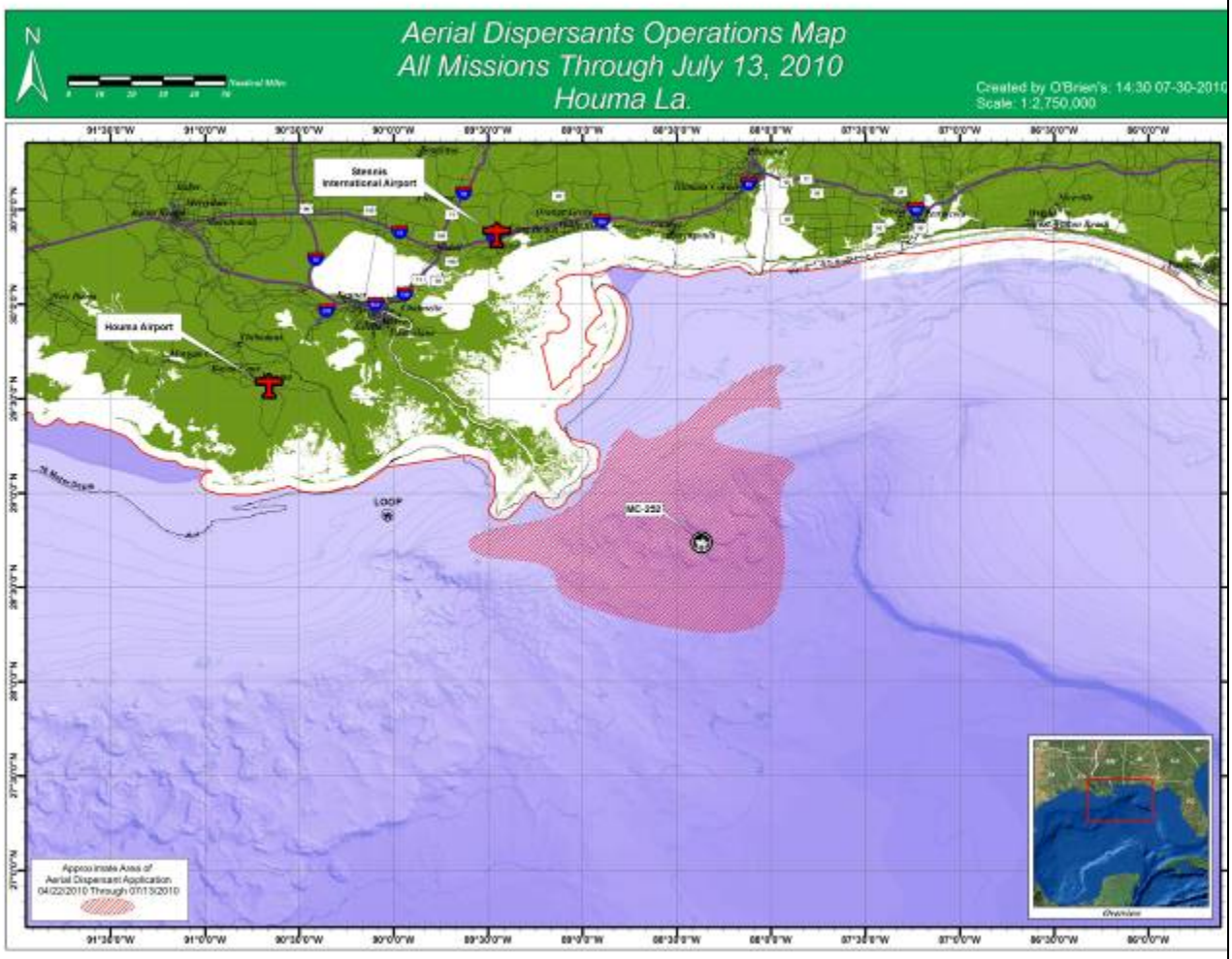


Photo July 15, 2010 showing magnitude and coverage of one particular oil slick

ATTACHMENT 1:
Aerial Dispersant
Lessons Learned, Recommendations and Amplifying Discussion

The area where approximately 90% of the dispersant was sprayed is shown in Figure 14 and indicates where these large oil slicks were located and the vastness of the operating area.

Figure 14 : Map showing the area where 90% of the spray passes were completed



Although hundreds of skimmers and in-situ burn vessels were operating, there were still large dispersible slicks that were not addressed by those response resources.

Ability to Remove Large Quantities of Oil from Surface Waters

The aerial dispersant operations were ramped up to employ four C-130s, one BT-67 and two DC-3 spray aircraft with a capability to apply 80,000-100,000 gallons of dispersant per day. With this dispersant capability an estimated 1,600,000 to 2,000,000 million gallons of oil per day could be treated and removed from the water's surface. For example on May 10, 2010, the aerial dispersant operation sprayed 56,000 gallons of dispersant covering an area of 17.5 square miles. This is a feat that could not be accomplished by skimming and ISB operations, even jointly.

Fast Response to the Incident and to Identified Oil Slicks

The aerial dispersant assets were activated at approximately 0200 CST on April 21. A C-130 and King Air at Stennis International Airport and a BT-67 and an Aero Commander were ready to

ATTACHMENT 1:
Aerial Dispersant
Lessons Learned, Recommendations and Amplifying Discussion

Lesson Learned #2:

2. In the early days of the response, the RRT pre-approval process was followed, and the FOSC's timely approvals led to the efficient and effective application of dispersants. However, Addendum 3 to the EPA Directive (May 26, 2010) which required BP to *"eliminate the surface application of dispersants,"* except in *"rare cases when there may have to be an exemption"* led to substantial dispersant approval delays. To satisfy the "rare-case exemption" required multi-agency, multi-level consultation and an analysis demonstrating that other response techniques were unavailable for the oil slicks identified. The time-consuming and constantly changing approval procedures prevented timely responses to numerous large oil slicks. This placed the shoreline at greater risk of oil coming ashore and diverted staff from other critical responsibilities in order to prepare the supporting documentation for each request.

#2 Recommendations

2a. Improve the RRT dispersant pre-approval process by updating and streamlining the process and procedures while allowing for meaningful and reasonable governmental oversight without unduly burdening or interfering with operational coordination and efficiency.

2b. FOSC daily approval of dispersants should be based solely on whether the dispersant continues to be effective in dispersing the oil. Dispersant operations supervisors should have the authority to decide which oil slicks to spray, the amounts to spray, and the aircraft to be used. SMART oversight and review should continue and be improved as discussed in lesson learned # 5.

2c. RRTs should review and revise dispersant approval processes and operational criteria and policies to expedite and simplify the dispersant pre-approval process, taking into account the lessons learned in the Deepwater Horizon response, pending USCG dispersant regulations which become final on February 22, 2011, and research and operational advancements.

ATTACHMENT 1:
Aerial Dispersant
Lessons Learned, Recommendations and Amplifying Discussion

ATTACHMENT 1:
Aerial Dispersant
Lessons Learned, Recommendations and Amplifying Discussion

Lesson Learned #3:

3. The energy industry's development of a core dispersant capability based on the system design approach proved instrumental in the success of the aerial dispersant response operations. The system design approach identified for each dispersant application task, the personnel, equipment, and procedures needed to successfully complete the task and ensured integration of all tasks through training and realistic exercises.

   The Deepwater Horizon response demonstrated that aircraft and personnel can be activated from distant locations to quickly produce an effective, large scale response.

#3 Recommendations

3a. Industry, collectively, should seek to develop and manage aerial dispersant application as a **global** response tool.

3b. Based on the system design approach as applied to the aerial dispersant mission, dispersant service providers should work together to standardize operating procedures and equipment. This would improve joint operations, web-based situational awareness and flight and spray documentation.

3c. Spotter/reconnaissance/spray aircraft should be outfitted with satellite phones for communicating with their staging base to facilitate the rapid flow of information versus waiting for the aircraft to land to provide time critical information (e.g., state of oil, dimensions and location of oil slicks, etc.). Spotter/reconnaissance aircraft should be outfitted with marine band radios for coordination of spray operations with vessels.

3d. Government and contract observers and spotters should, to the maximum extent practical, be comprised of individuals who are well-trained and experienced to recognize the various stages of oil weathering, what is dispersible and non-dispersible oil, indicators of dispersant effectiveness and the difference between oil and biological material (e.g., seaweed and algae bloom). Standardized approaches and training in documenting and reporting observations is also necessary so that staging and command center management will have sufficient, consistent and accurate information for appropriate decision making.

3e. Spray and spotter aircraft providers and the response cooperatives that manage aerial dispersant assets should work closely together (i) to standardize operating procedures, aircraft tracking equipment and communication and documentation equipment and (ii) to coordinate response plans that provide a unified U.S. aerial response capability for worst case discharges.

3 Discussion

ATTACHMENT 1:
Aerial Dispersant
Lessons Learned, Recommendations and Amplifying Discussion

The aerial dispersant system that was used during the DWH response was initiated by industry in 2003 with a commitment to improve the current aerial dispersant capabilities. In improving and developing the aerial dispersant application system, each dispersant application task was identified. Procedures, equipment, personnel, support, etc., needed to properly perform the task were then prepared, sourced and implemented. Finally, each task was integrated with the other tasks through training and exercises to ensure a cohesive dispersant application system.

There are many components in the dispersant system. If any one is missing or faulty, the system is incomplete and the mission will not be performed at the highest level. The major components of the Dispersant System are

- Spray Application aircraft and trained crews
- Spotter/Reconnaissance aircraft and trained crews
- Observer aircraft and trained observers (as required)
- Sufficient dispersant stockpiles and testing of stockpiles
- Command center and staging airport management teams
- Communications (Sat phone, air/marine VHF, text, cell)
- Logistics Equipment and Plans
- Ground support and dispersant transfer systems and personnel
- Staging airport ground support & management
- Real time, web based situational awareness of all aircraft (SkyConnect)
- Spray pass and sortie reporting & documentation equipment (SatLoc)
- Dispersant operating plans, forms, and data bases
- Maintenance plans and spray system testing
- Training and exercise program

In developing the aerial dispersant system, two new, off-the-shelf equipment items were applied to meet operational and reporting requirements that proved invaluable to the operations.

SkyConnect

SkyConnect provides communication and tracking capability for both spray and spotter aircraft. It includes a satellite telephone and the capability to send text messages. This permitted the staging base and the Aerial Dispersant Group to communicate directly with any aircraft that had a SkyConnect system installed. The advantages were:

a. spotter aircraft could call in to advise the location and size of slicks they found without having to return to home base;
b. spotter aircraft could advise the spray aircraft to launch when they found a suitable oil slick;
c. staging base could advise the spotter/spray aircraft if there was a change in spray zones assigned; and
d. staging base could advise of changes in operations, e.g., direct spotter to recon another area, advise of changes in application, request return to base, etc.

SkyConnect also plots the aircraft on a web based map and updates the position at one minute intervals allowing the staging base and the Aerial Dispersant Group to view the position, speed, direction and altitude of the spray and spotter aircraft on a large screen monitor. This continuous view

of the operating area permitted watching the spotter aircraft conduct their reconnaissance patterns and the spray aircraft conduct their application patterns.

Furthermore, when reports of spraying over vessels or platforms were received, it was possible to quickly determine if any dispersant aircraft had been or were in the area. Additionally, the SkyConnect system records flight data (latitude, longitude, time, date, etc.) which is downloadable and is archived for posterity.

Unfortunately, not all of the spray and spotter aircraft had SkyConnect equipment. Some had similar equipment, and others had to be given Blue Force Trackers, for them to be seen on the web-based situation map. It would be very helpful for all dispersant spray and spotter aircraft to have the same equipment. Also, it would be helpful for aircraft with SMART observers to have SkyConnect installed.

Satloc

Satloc provides real time spray pattern flight assistance and views of the spray area. Satloc also automatically records in one-second intervals flight path information and records when the aircraft spray system is on or off. While the aircraft is in flight, Satloc offers the following features

a. a light bar positioned in front of the pilot advises him how many feet left or right of a selected path he is flying.
b. a view of the spray area showing the 3 nm offshore line, 10 meter depth line and the location of marine sanctuaries so that the pilot can know where to spray.

For documentation, Satloc

a. records, at one-second intervals, the latitude and longitude, the altitude, the aircraft speed, the aircraft direction, and if the aircraft was spraying or not spraying;
b. permits downloading the flight information to a computer and replaying the flight; and
c. generates reports which state for each spray pass the length of the pass, start and stop times of the spray pass, the amount of dispersant sprayed, the dosage, the speed of application, and the direction of the aircraft during spraying.

The Satloc files enabled the plotting of each spray pass on the operational area charts to show the Unified Command and other interested parties where and how much dispersant had been applied. Additionally, the Satloc files assisted in responding to allegations of spraying dispersant on fishing vessels, platforms and shoreline responders. By having solid proof of the location and times of spraying, it was easily shown that spraying had not occurred in those locations or was clearly outside the safety setbacks.

Again, not all of the spray and spotter aircraft had Satloc installed. Several of the aircraft were outfitted with Satloc systems during the response, the USAFR used a similar system and Lynden and OSR aircraft used a work around with personnel on the aircraft hand operating Garmin GPS units to record spray passes. It would be helpful to have all spray and spotter aircraft have the same documentation and flight assistance equipment.

These were two of the newer pieces of equipment added significantly to the effectiveness of the dispersant system. However, in using the systems approach, it is recognized that procedures, training, exercises, support, and maintenance are all just as important. The many improvements in these areas

are not presented here as they are too numerous to describe in this report. Thus, each component of the dispersant system, and the many sub-components, are necessary, if the dispersant operation is to achieve the expectations of the UC, RP and response community.

Lesson Learned #4

4. Inclusion of an embedded science evaluation and analysis team within the Houma Operations Aerial Dispersant Group enabled the Group to address in real-time important issues such as dispersant efficacy, application effectiveness, and monitoring of possible dispersant and dispersed oil impacts on the marine environment. Additionally, the science team was able to help ensure timely and informed responses to the Unified Command, public and government agency requests for scientific and technical information on dispersants and potential dispersant and dispersed oil impacts.

#4 Recommendations

4. Future spill responses that might involve potentially significant dispersant applications should have an embedded Dispersant Science Team that is integrated within the Aerial Dispersant Group to:
    - Assess dispersant effectiveness in real-time.
    - Conduct monitoring and data collection regarding dispersant use and impact, such as, concentrations of oil and dispersant at the water surface and at depth, and address questions regarding potential environmental impacts.
    - Respond to Unified Command, public and government agency requests during the response regarding scientific and technical information on dispersants, including, as appropriate and required: information on the use of dispersants in prior spills, field data and analyses as available during the incident, and laboratory studies.

4 Discussion

Upon full activation, the Aerial Dispersant Group at the Houma Incident Command Post (ICP), identified three important sampling and monitoring objectives .

- Measurements and data to evaluate the effective dispersal of the MC 252 crude oil being released from the BP Macondo well
    - Scientific evidence was required to prove that aerial and boat dispersant application was not damaging the marine environment in the upper 1 to 10 meters of the water column in the Gulf of Mexico, and
    - Field and laboratory testing of alternative dispersants to respond to EPA's requirement that BP identify an alternative to the Corexit products used that was less toxic, but as effective on the DWH crude oil under the conditions in the Gulf of Mexico.

ATTACHMENT 1:
Aerial Dispersant
Lessons Learned, Recommendations and Amplifying Discussion

To address these three objectives, a Dispersant Science Team was formed during the early weeks of May and embedded into the Operations section as a branch of the Aerial Dispersant Group. Embedding the science team and having it report directly to the Supervisor, Aerial Dispersant Group permitted close coordination and cooperation and focused the science team's efforts on the three high priority dispersant activities. The science team members were full participants in the Aerial Dispersant Group, and this close working relationship allowed the Dispersant Science Team to support dispersant operations. One of the most important efforts involved outfitting the *M/V International Peace* (IP) as the main dispersant evaluation vessel and equipping it with Oil Spill Response (OSR) personnel and contractors to operate the boat spray system, conduct SMART Tier 2 & 3 and expand monitoring ("Super Smart") to include water chemistry sampling and toxicological sampling at multiple depths. The *M/V International Peace* also provided a spray research platform for dispersant analysis by equipping it with a boat spray system and dispersants. IP operations were closely coordinated with aerial spray operations to locate oil slicks for testing and to arrange monitoring of aerial spray applications. This permitted IP the maximum use of its dispersant monitoring capabilities.

Other science team work included:

- Coordinating with SMART Tier 1 activities.
- Establishing a QA/QC program for SMART 1, 2 & 3 monitoring data and arrange posting to a web data sharing site.
- Developing and implement sampling protocols and plans for analysis of water chemistry and toxicity analysis of dispersed oil plumes formed the surface application of dispersants.
- Reviewing established literature and NCP Product Schedule data.
- Managing field and laboratory trials of selected alternate dispersants to determine effectiveness.
- Obtaining and analyzing samples to assess the impacts caused by the emergency discharge of Corexit into Barataria Bay.
- Establishing a program to analyze citizen samples collected and provided by fishermen and the public to determine presence of dispersants.
- Developing risk communication papers, presentations and other information for town meetings. Participation in town meetings to explain the use of dispersants and their environmental impacts and safety.
- Developing a wave height determination study for application of dispersant to show that the dispersant was effective in wave heights as low a 0.5 to 1.0 feet.
- Evaluating the effectiveness of dispersants on weathered and emulsified oil by coordinating and directing the SINTEF and SL Ross sampling and analysis projects.

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Lessons Learned, Recommendations and Amplifying Discussion

Lesson Learned #5

5. SMART did not work as originally envisioned and as stated in the SMART Protocols.

#5 Recommendations

5a. Review and improve SMART observation procedures, data deliverables, and method of delivery based upon field experience implementing SMART Tier 1, 2, and 3 procedures during the Deepwater Horizon response. Implementation of SMART is critical for assessment of dispersant effectiveness and continued dispersant application during a response.

5b. SMART data, photographs and observations should be collected in a webserver that is accessible by different organizations during the response and reviewed on a daily basis with the Aerial Dispersant Group so that they can refine operations, clarify observations, and coordinate the next day's spray/SMART missions.

5c. Update the SMART manual to address data collection, interpretation and presentation and QA/QC. As part of this activity, cross-calibration of instrumentation, personnel observations, and data collection procedures should be developed to standardize results from different teams/individuals.

5d. Initiate and sustain ongoing training of personnel who will conduct SMART Tiers 1, 2 and 3 procedures so that these responders remain proficient in the use, maintenance and calibration of the instruments and in operational procedures, data security data interpretation and presentation, and documentation to eliminate the need for initial or refresher training of SMART personnel at the time of the response.

5e. SMART monitoring should <u>not</u> be required for every spray sortie once dispersant efficacy has been established. The SMART Team Leader should tailor monitoring plans and consult the Environmental Unit as needed.

5f. Aerial dispersant operators and SMART observers should, at the commencement of spray operations, meet to discuss communications and joint operational procedures to ensure timely SMART/spray aircraft rendezvous at the dispersant application site. Coordination would be further facilitated by embedding a SMART member in the Aerial Dispersant Group and at the staging base.

Lesson Learned #6

6. During the Deepwater Horizon incident, it became apparent that key regulatory decision-makers, numerous elected officials, the media and the public lacked an understanding of dispersants, their importance, their pre-approvals and past utilization, the non-toxic nature of the surfactants, and the safety measures employed to minimize any potential harmful impacts. As a consequence, uninformed opinions and anxiety supplanted reasoned, trained and educated dialogue, in turn leading to needless delays, impediments and distractions during the response.

ATTACHMENT 1:
Aerial Dispersant
Lessons Learned, Recommendations and Amplifying Discussion

#6 Recommendations

6a. Affirmatively educate the public, media, regulatory agencies and elected officials at the Federal, State and local levels about the value, safety, and benefits of using dispersant, *from the outset of the response*. During the response, timely and regularly inform such stakeholders about where and why dispersants are being applied, how the dispersants are being applied, the precautions being taken to protect the public, the environment and response workers, and the benefits being achieved by the dispersants being applied. Maintain an open, continuous dialog with the media and an outreach program to stakeholders throughout the response. Federal, State and Responsible Party responders should work together to agree to and provide accurate and timely information to ensure the information will be accepted and correctly acted upon during the response, and to address potential fears and concerns of the public.

6b. Immediate information sharing, risk communication and outreach efforts to the media, public and elected officials should to be implemented by Unified Command when dispersants are to be utilized on a response. Furthermore, consideration should be given to embedding a person in the Aerial Dispersant Group to coordinate and manage this effort through the JIC.

6c. Government officials with dispersant decision-making or oversight responsibilities should be provided with an in-depth briefing on completed dispersant research and facts so that these officials can make sound environmental response decisions. Additionally, federal agency representatives and responsible parties should timely explain dispersant use decisions to the general public during a response.

6d. Each RRT should implement and institutionalize a dispersant authorization training and exercise program for their members and decision makers so that they better understand the process, regulations, operations, equipment, monitoring and the health and safety aspects of dispersant use and the lessons learned from previous responses.

6e. Ecological risk assessment workshops should be conducted in each RRT, *in advance of the next incident of national significance*, so that full discussions can be had and consensus can be reached among decision makers and environmental experts about the use of dispersants and the operational and environmental trade-offs in using dispersants versus other response techniques.

6 Discussion

During the Deepwater Horizon response, the Unified Command did not sufficiently inform the public and public officials about the benefits of aerial dispersants use and subsea injection of dispersant at the well head, nor did it effectively refute misinformation in the media about the potential toxicity of dispersants. Furthermore, the media often confused aerial application with subsea application when in reports about the monitoring and toxicity of subsea oil plumes. Little was done by the Unified Command to correct this misinformation, nor were the public, media, elected officials and regulatory agencies adequately informed about dispersant usage and its benefits.

To the detriment of the dispersant response, the vast research on dispersants conducted during the

1990s was not initially consulted, appreciated or used. During the 1990s dispersant risk communication and Ecological Risk Assessments (ERA) had been developed. The ERAs had been conducted in most RRTs to bring together the leading government, environmental and wildlife experts to assess the environmental trade-offs of using dispersants versus not using dispersants to respond to an offshore oil spill. These ERAs led directly to the RRTs implementing pre-approval, expedited approval and full RRT approval procedures for the use of dispersants in their areas. This body of information was apparently unavailable to many regional and national agency decision makers.

Significant risk communication issues arose during the Deepwater Horizon response.

- Fishermen, responders and the public in shoreline communities reported illnesses such as headaches, nausea, respiratory difficulties and claimed they were the result of exposure to dispersants. Individuals also claimed that aerial dispersant activities were being conducted under the cover of darkness throughout the night. Natural Resources Defense Council staff blog on July 30 stated, "According to BP cleanup workers and local residents, they're still spraying, even spraying close to shore at night."

- Spray incidents were reported by individuals on boats and platforms with expressions of grave health concerns even though, time and again, aerial spray operations were proven through automatically recorded flight tracts to have been 50 nm or more away from where these individuals were located. Associated Press reported on June 3 in an article titled, "Oil Spill Workers Complain of Flu-like Symptoms," *"..., who was part of a crew burning oil, believes planes were spraying dispersant in the middle of the night — something BP disputes. 'I began to ache all over ...' he said in the affidavit. 'I was completely unable to function at this point and feared that I was seriously ill.'"*

- Some individuals with technical and scientific backgrounds and Non-Government Organizations (NGO) stated that the Gulf of Mexico was being irreparably damaged. "Toxic Oil Dispersant Used in Gulf Despite Better Alternative" published in *Wire Science* June 21 with the following photo:

- National news agencies stated that dispersants are toxic, and the EPA demanded that less toxic dispersants be used. This demand was made even though there was a substantial body of

research proving Corexit EC9500A, the dispersant in use, was effective and safe. Furthermore, scientific experts on May 26-27 concluded that dispersants should be a response tool. *The Washington Post,* on May 20, 2010*,* reported, "The Environmental Protection Agency informed BP officials late Wednesday that the company has 24 hours to choose a less toxic form of chemical dispersants to break up its oil spill in the Gulf of Mexico, according to government sources familiar with the decision, and must apply the new form of dispersants within 72 hours of submitting the list of alternatives."

All of the above contributed to public fears and mistrust that adversely affected the dispersant response.

Lesson Learned #7

7. The best means of identifying dispersible oil was with trained, experienced dispersant aircraft spotter/reconnaissance pilots and observers. Current aerial remote sensing and satellite imagery and operations proved ineffective and inconsistent in identifying dispersible oil and providing timely observations/reports for spray operations. For aerial dispersant operations, satellite and remote sensing systems did not consistently locate the thickest parts of the oil slick, i.e., the portion that is dispersible and they identified some non-oil targets such as algae, and sea weed as being dispersible. Additionally, the reports from these systems were not available early in the morning, when needed for a full day of aerial application, due to the timing of the satellite over passes and the time required to schedule and process the imagery.

#7 Recommendations

7a. Improve photographic capabilities on spotter/reconnaissance aircraft. Improved photography can significantly assist the evaluation of dispersant effectiveness by more clearly showing the change in color and shape of an oil slick after being sprayed with dispersant. Improved photography can also provide more accurate data to assess the size (length, width and percent coverage) of an oil slick and estimate the amount of the oil in the slick. Having this information facilitates better assignment of spray aircraft to match the swath width and payloads to specific slicks. Efforts should also be made to forward data directly from aircraft to command centers and staging bases for evaluation.

7b. Improve air-to-surface communications. Each spotter/reconnaissance aircraft should be fitted with a marine band radio to communicate with vessels which are either conducting SMART monitoring or are near the spray area and need to be advised of pending spray operations. Also, satellite phones should be required to ensure that spotter/reconnaissance and spray aircraft can communicate with their staging base to relay information on the movement and configuration of slicks over time, to assist in daily operational response planning, report on the effectiveness of the dispersant and size of the oil slick, etc. During this response many of the aircraft did not have this capability and had to return to base to provide information. This caused a delay of almost an hour in information transfer from some aircraft. Finally, all communications should be through an intercom system with an available headset for every seat in the aircraft.

7c. All personnel serving as observers/spotters should be trained to recognize when dispersant is effective, the various stages of oil weathering and dispersible and non-dispersible oil. They should

also be trained to know the specific observations that need to be made and how to document these observations for each sortie so that ground management will have sufficient and accurate information to make appropriate, timely decisions.

Lesson Learned #8

8. The response strategy for using aerial dispersants in conjunction with mechanical recovery and in-situ burning should continue to be developed, refined, communicated, coordinated and executed to maximize the removal of oil from surface waters during a response.

#8 Recommendations

8a. RRTs should set a primary response objective and metric for offshore oil spills to be; the most expeditious removal of the most oil from surface waters, consistent with safe practices and other response objectives.

8b. RRTs should continue develop priorities and strategies on how best to simultaneously use mechanical recovery, dispersants and in-situ burning to maximize total surface oil removal.

8c. RRTs should review the various scenarios for the worst case discharges in their areas of responsibility, review currently available response assets and their capabilities to respond to these scenarios and develop response strategies that maximize surface oil removal. The strategies developed should consider the benefits and timeliness of dispersant response and how best they can be used to minimize shoreline and wildlife impacts and damages.

8d. RRTs should review and update current dispersant policies and procedures to provide consistent criteria and procedures for dispersant operations. In appropriate circumstances, policies might address issues such as dispersant volume/area/time limitations, wave height limitations, pre-approval information requirements, and criteria and procedures for the surface application of dispersant over extended time periods.

8e. RRTs should consider implementing consistent, uniform dispersant policies and procedures to facilitate the new U.S. Coast Guard regulations which require certain vessel and facilities to be able to apply approximately 50,000 gallons of dispersant over a three day period. These USCG regulations are scheduled to take effect in February 2011.

8 Discussion

Offshore Response Objective

The primary objective in responding to an offshore oil spill should be **to remove as much oil as rapidly as possible from surface waters to prevent it from reaching shore and damaging vital spawning areas and offshore wildlife, i.e., diving birds, turtles, whales, etc.** The response strategy developed to accomplish this response objective should maximize the combined removal ability of the three proven response techniques -- Mechanical Recovery (skimming), In-Situ Burning (ISB) and surface dispersant application. Developing a sound response strategy is a challenge

because all three response techniques work best in the freshest and thickest oil. Difficult decisions concerning trade-offs must be made in prioritizing assets to areas of the spill to reach the overall objective. It is not simply a matter of maximizing each technique individually.

Offshore Response Strategy Development

The following examples of some of the strategic response options possible for the DWH release are provided to illustrate the options in preparing a response strategy.

Option 1
- Use dispersants within a 5-10 nm radius of the source release site to maximize its effectiveness and coverage
- Use large skimmers and ISB outside a 5 or 10 mile radius of the source on slicks that escape dispersant.
- Use small skimmers to protect near shore areas and the waterway entrances into the marshes.

Option 2
- Use large skimming vessels within 3 nm radius of source to maximize their recovery capabilities
- Use ISB and small skimmers from 3 nm to 15 nm radius of source to remove slicks escaping the large skimming vessels.

Option 3
- Use dispersants outside of 15 nm radius of source to chase slicks that get away from skimmers and ISB.

Option 4
- Use large OSRVs within 5 nm radius of source to maximize skimmed oil recovery
- Assign ISB an area outside of 5 nm for burning
- Use dispersants on oil slicks outside of 5 nm and ISB designated area
- Use small skimmers to protect near shore areas and the waterway entrances into the marshes

The above are just three of the many options possible. Which strategy is the most effective in meeting the primary objective of removing surface oil and protecting the shoreline? Factors that must be considered in developing the most effective strategy include the number and type of skimmers available, number and type of spray aircraft available, the number of burn booms and vessels available, the response times, effectiveness and limitations of these assets, as well as oil characterization and the spill distance offshore.

Developing a successful response strategy for an ongoing oil spill incident takes knowledge of the field capability of the response assets at hand and a team composed of professional responders leading the offshore response sections.

Offshore Strategy Approval and Execution

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Lessons Learned, Recommendations and Amplifying Discussion

Once the offshore response strategy is developed, it must be approved by the Unified Command, and there must be a means of monitoring, communicating and controlling the operations to achieve its goal. Implementing response strategies will require overcoming many of the difficulties that were encountered during the DWH response as vessels will naturally go where the oil is regardless of Command Center agreements. These difficulties included:

1. deciding which response technique will be assigned to the richest areas of oil;
2. vessels, whether skimming or collecting oil to burn, chased oil slicks out of their designated area or did not stay in their designated area, thus interfering with or preventing the use of another response technique;
3. a skimming or burn vessel in the dispersant assigned area prevented aerial dispersant application from taking place;
4. skimming vessels not being able to enter the "burn box" area to skim oil;
5. establishing reasonably sized areas of operations to maximize overall recovery, (there were requests for 400 sqmi areas); and
6. communicating with vessels to redirect them out of a slick or back into their designated area.

Successful execution of the offshore response strategy requires daily field monitoring of all response technologies by an experienced responder equipped with air/air, air/ground and satellite communications for talking with field assets and the command center.

RRT Guidance to Assist Offshore Strategy Development

Developing an offshore response strategy during a spill incident is difficult. However, this effort can be assisted with guidance or criteria from the RRT on the following:

- Determining Worst Case Discharge Quantities for Planning;
- Guidance on prioritizing the use of each response technique; and
- Guidance on the amount of dispersant that can be applied, over what area and in what amount of time.

Armed with guidance for offshore response strategies responders can quickly develop a strategy for the specific spill situation presented, because no two spills or oils will be alike. A brief discussion follows:

What is the Worst Case Discharge?

The DWH incident clearly demonstrated that catastrophic amounts of oil can be released into ocean waters from offshore drilling and production facilities. In a deepwater blowout a million or more gallons of crude oil can be released into the ocean. Major spills are also possible from VLCCs carrying approximately 2 million barrels of oil and from offshore pipelines.

What size spill should we plan to recover and remove? OPA-90 requires stated amounts of skimming capability, but no ISB capability. Regarding dispersants, new U.S. Coast Guard regulations for vessels and oil transportation facilities will require, by February 2011, an ability in the Gulf of Mexico to apply

55,000 gallons of dispersant 50 nm offshore within three days. This is enough dispersant to spray only about 25,000 bbls of oil. Is this sufficient? During the DWH response, the aerial assets brought to the spill had the capability of applying up to 100,000 gallons per day. Was that sufficient? For offshore facilities regulated by BOEMRE there are currently no regulatory requirements for dispersant amounts to be applied. Deciding on the spill size to plan for is essential!

Prioritizing Response Assets for Offshore Response
Regarding the offshore strategy for the DWH response, the surface application of dispersants was minimized and almost eliminated in spite of the fact that it was the most appropriate and effective response tool for large oil slicks in the offshore area. The benefit of dispersants is supported by the Federal Oil Budget report which showed that dispersants accomplished as much as skimming and ISB combined. In fact, depending on the effectiveness assigned to assets, aerial dispersant application by itself may have removed more oil than skimming and ISB combined during the DWH response. This is quite an achievement considering EPA mandated aerial dispersant elimination on May 26.
Figures 6 and 7, respectively, show that the aerial application of dispersants can remove, on the open ocean, much greater amounts of oil due to the large encounter rates and can operate under a much wider set of environmental conditions.

The RRT should state that dispersants are the preferred response tool for these types of scenarios considering the distance offshore that a worst case discharge can occur and the other factors involved.

Guidance should also be given as to whether to skim or to burn, since these two techniques use similar vessels and have similar encounter rates.

What is the Maximum Dispersant Volume?
The amount of dispersant that can be acceptably applied by air and boat application to surface oil slicks should be studied as to

- the impact on the marine environment;
- the time dispersed oil lasts in the water column;
- the overall operating area where dispersant is being applied;
- the area covered per day; and
- the monitoring capability.

Restrictions on approved response strategies should not be set during a response, especially during a worst case discharge. If the RRT or EPA is going to set any limits on dispersants as to amounts allowed to be sprayed on a daily basis or per unit area, those restrictions should be determined soon and stated clearly in RRT dispersant policies. Any limitations should be supported by sound scientific analysis as the policy will drive dispersant application equipment and implementation.

CONCLUSIONS

Dispersants, mechanical recovery and in-situ burning are all needed for responding to oil spills, and each technology has its own pros and cons. To move forward we must maximize the benefits of our response technologies when used separately and, most importantly, when used simultaneously. With

sound RRT guidance the Unified Command can develop an incident response strategy that uses all of the assets available to maximize the removal of surface oil and reduce the environmental damage of a spill.

ATTACHMENT 2

WCS-Submitted, USCG in person

REQUIRED FORMS 4/22

Dispersant Pre-Approval Initial Call Checklist

Boxes denote essential information

CALLER

Time of Initial Call: Date: 4/21/10 (Month Day Year) Time: __ CT (24 hour clock)

Name of Caller: Donna Gyles

Telephone #: 281-782-8339

Name of Alternate Contact: Carlos Moreno

Telephone #: 281-995-1170

Company Name: BP

Address:

Street: 200 Westlake Park Blvd

City: Houston

State: TX Zip Code: 77079

SPILL

Initial Time of Spill: Date: 04/20/2010 (Month Day Year) Time: 2200 CT (24 hour clock)

Location of Spill: LAT: 28° 44.54' N LON: 88° 19.16' W

Block Name: MC Block Number: 252

Type of Release: [Instantaneous (☐) or Continuous Flow (☒)]

Oil: Name: Louisiana Sweet Crude

API: 35° Pour Point: < -15 °C ☐ or °F ☒

Amount Spilled: see below [GAL ☒ or BBLS ☐(42 Gal/BBL)]

Flow Rate if Continuous Flow (Estimate): 162,000 bbls/day (Worst case discharge)

ON-SCENE WEATHER (Note: If not available contact SSC for Weather)

Wind Direction From (Degrees): WNW Wind Speed: 5-10 Knots

Surface Current (Direction toward, Degrees): 55

(Speed): 0.5 knots Knots

Visibility: 5 Nautical Miles

Ceiling: unlimited, becoming cloudy in evening Feet

Sea State (Wave height): 1 ft in morning, in afternoon 2-3 Feet

DISPERSANT SPRAY OPERATION

Dispersant Spray Contractor

Name: MSRC Contact: Theo Camlin

Address:

Street: 100 Herbert Harvey Lane

City: Buras

State: LA Zip Code: 70041

Telephone: (713) 309-5758

Dispersant: Name: Corexit 9527 (need between 18950 gal minimum, 442716 gals maximum) of corexit 9527. For this use

Quantity Available: C130 – 3250 gal and King Air 400 gal capacity DC3 and BT67 – 2000 gal capacity; 27,000 gal available at Stennis

Platform: Aircraft Type: MSRC - C130 and King Air ASI - DC 3 and BT 67 ASI

Multi-Engine (X) or Single-Engine (☐)

Boat Type: M/V Gulf Princess (dedicated vessel for first strike team)

Other:

Dispersant Load Capability (Gal): 0 (observer only/logistics for first strike team)

Time to First Drop on the oil (Hours): 37 mins from Stennis

CALCULATION FOR WORST CASE DISCHARGE (Slick length 4.7 nm, width 2.1nm)

1 sqaure mi =
640 acres

3-7 gals dispersant are required per acre

	spill area	9.87 square miles		
	spill acre	6316.8 acres		
3-7 gals	dispersant	18950.4 gal	44217.6 gal max	
		31584 gal (@ 5 gal/acre)		

	Gals load	Number trips	Volume Dispersant from Air
King Air	400	8	3200
C-130	3250	8	26000
Total	3650		29200 – total from 8 trips King Air + C-130

9 trips needed

FOSC DISPERSANT USE CHECKLIST

(Items on the far left of this checklist are keyed to letter and numbers on the top of the boxes in the FOSC Dispersant Use Flowchart and apply to offshore pre-approval only. INFORMATION AVAILABLE IN THE DISPERSANT PRE-APPROVAL INITIAL CALL CHECKLIST, AND THE TABLE ON THE OTHER SHEET ARE NECESSARY TO COMPLETE THIS CHECKLIST.)

OIL SPILLED

A. FOSC completes and evaluates DISPERSANT PRE-APPROVAL INITIAL CALL CHECKLIST.
B. Ask spiller if dispersant spray operation is on alert pending completion of pre-approval use evaluation by the FOSC.

[1] DEPLOY SMART

A. Immediately Deploy USCG Strike Team SMART Team to the spill site if dispersant use is likely. Every attempt should be made to implement the on-water monitoring component of the SMART monitoring protocols in every dispersant application. At a minimum, Tier 1 (visual) monitoring must occur during any dispersant operations approved in accordance with this Dispersant Pre-approval Guidelines and Checklist
B. Immediately notify DOI/DOC survey specialist contact identified in Appendix A if dispersant use is likely.
C. Deploy mechanical and/or in-situ burn operations, weather allowing.

[2] PRE-APPROVED DISPERSANT OPERATIONS ACTIVATION EVALUATION

1. Do you expect the use of dispersants in this case to provide an environmental benefit?
The NOAA SSC should be contacted for trajectory and environmental fate analysis.

YES	(X)	GO TO SECTION 2 BELOW
NO	( )	GO TO SECTION 11 BELOW

2. Plot the position of the spill on the appropriate nautical chart, draw a circle about the spill source with a 10 nautical mile radius as a worst-case scenario for surface movement. Hash mark any area within the circle that is in waters less than 10 meters deep or 3 nautical miles from shore. What is left is considered the dispersant operational area.
Is the dispersant operational area to be in offshore water that is no less than 10 meters deep and at least 3 nautical miles from the nearest shoreline?

YES	(X)	GO TO SECTION 3 BELOW
NO	( )	GO TO SECTION 9 BELOW

3. Was a contractual relationship with a dispersant spray contractor established prior to the spill?

YES	(X)	GO TO SECTION 4 BELOW
NO	( )	GO TO SECTION 9 BELOW

4. Dispersant Platform
Considering the amount of oil spilled, the location of the operational area, volume of available dispersants to be used, and the timeframe in which the required equipment can be on-scene, what is the most effective application platform? More than one platform type may be considered.

If Aerial	GO TO SECTION 5 BELOW
If Boat	GO TO SECTION 6 BELOW
If Other	GO TO SECTION 7 BELOW

5. Aerial Application Operational Conditions

[A] If on-scene weather was available from the spiller on initial telephone contact use that information to complete this section and assume for planning purposes that it will remain the same during the timeframe in which this decision is operating. At the earliest opportunity, contact the SSC for detailed weather, but do not delay this decision process for the SSC weather input (Note: All dispersant operations are carried out during daylight hours only).

Winds less than or equal to 25 knots, and
Visibility greater than or equal to 3 nautical miles, and
Ceiling greater than or equal to 1,000 feet?

YES	(X)	GO TO SECTION 6 BELOW
NO	( )	GO TO [B] IN THIS SECTION BELOW

[B] Notify the spiller's representative that the dispersant use decision has been delayed until the weather improves, and that the Dispersant Spray Operation is to be placed on a standby status.

GO TO SECTION [C] IN THIS SECTION BELOW

[C] Consult with RRT 6 members. Contact the USCG Co-chair at USCG District 8, EPA, DOI, DOC, and Louisiana and/or Texas RRT representatives to notify them that dispersants are being considered, but delayed due to weather. When the weather is beginning to improve:

BEGIN AGAIN IN SECTION 2 ABOVE

6. Boat Application Operational Conditions

[A] If on-scene weather was available from the spiller on initial telephone contact use that information to complete this section and assume for planning purposes that it will remain the same during the timeframe in which this decision is operating. At the earliest opportunity, contact the SSC for detailed weather, but do not delay this decision process for the SSC weather input (Note: All dispersant operations are carried out during daylight hours only).

Wave height such that the boats to be used for the dispersant application can conduct an effective and safe spray operation?

YES	(✓)	GO TO SECTION 6 BELOW
NO	( )	GO TO [B] IN THIS SECTION BELOW

[B] Notify the spiller's representative that the dispersant use decision has been delayed until the sea state improves, and that the Dispersant Spray Operation is to be placed on a standby status.

GO TO SECTION [C] IN THIS SECTION BELOW

[C] Consult with RRT 6 members. Contact the USCG Co-chair at USCG District 8, EPA, DOI, DOC, and Louisiana and/or Texas RRT representatives to notify them that dispersants are being considered, but delayed due to sea state. When the sea state is beginning to improve:

BEGIN AGAIN IN SECTION 2 ABOVE

7. Immediately consult with the Scientific Support Coordinator (SSC) to evaluate potential alternatives to the Aircraft and Boat Platforms.

[A] After a briefing on the spill response situation from the FOSC, does the SSC recommend aerial application of Dispersants?

YES	( )	GO TO SECTION 5 ABOVE
NO	( )	GO TO [B] IN THIS SECTION BELOW

[B] After a briefing on the spill response situation from the FOSC, does the SSC recommend boat application of Dispersants?

YES	( )	GO TO SECTION 6 ABOVE
NO	( )	GO TO [C] IN THIS SECTION BELOW

[C] After a briefing on the spill response situation from the FOSC, does the SSC recommend an alternative platform?

YES	( )	DEVELOP A PLAN AND GO TO SECTION 8 BELOW
NO	( )	GO TO SECTION 11 BELOW

8. Is the dispersant to be used listed on the NCP Product Schedule and considered appropriate for existing environmental and physical conditions?

YES	(X)	GO TO SECTION 10
NO	( )	GO TO SECTION 9

9. **GO NO FURTHER** IN THIS FOSC DISPERSANT USE CHECKLIST. The request for dispersant use does not qualify under the guidelines for pre-approval use of dispersants in Region 6. Contact your SSC and begin the dispersant use approval process as specified in the RRT 6 Regional Contingency Plan Subpart H Authorization (Authorization for Use of Dispersants in Non-Life Threatening Situations)

10. Dispersability

Refer to the Dispersant Pre-Approval Initial Call Checklist

Does the available technical information suggest that dispersion is likely given the spilled oil, anticipated oil weathering, and selected dispersant? Use the FOSC Dispersant Use Oil Table and any technical sources such as the SSC to make this assessment.

YES	(X)	GO TO 12 BELOW
NO	( )	GO TO 11 BELOW

11. **GO NO FURTHER** IN THIS FOSC DISPERSANT USE CHECKLIST. In this case dispersant use is either inappropriate for this response or will probably not be considered to be effective relative to the effort required.

Concentrate your efforts on Mechanical and/or in-situ burn operations

Note: You may want to consider dispersant pre-approval use at a later time if the field situation changes (i.e., becomes a continuous spill or has a new instantaneous release.) In such an event, make sure the Initial Call Checklist has been updated and return to the start of this checklist (OIL SPILLED ON PAGE 6.)

12. INITIATE APPLICATION OF DISPERSANTS WITHIN THESE RRT GUIDELINES.

- Water depth ≥ 10 meters and no less than 3 nautical miles from nearest shoreline.
- The SMART controller/observer should be over the spray site before the start of the operation. If possible, a DOI/DOC-approved marine mammal/turtle and pelagic/migratory birds survey specialist will accompany the SMART observer, but the operation will not be delayed for that individual (see Appendix A for contact information).
  Note: The purpose of SMART monitoring is to confirm best professional advice related to the potential success of dispersant use. Given the uncertainty involved relating to physical and environmental condition, oil weathering, and dispersant and oil interaction, we must rely on positive feedback from the monitors to continue dispersant application.
- Personal protective equipment for personnel on-site will conform to the appropriate dispersant's MSDS
- If dispersant platform is an aircraft, spray aircraft will maintain a minimum 1000-foot horizontal separation from rafting flocks of birds. Caution will be taken to avoid spraying over marine mammals and marine turtles.
- If dispersant platform is a boat:
  - If the system involves spray arms or booms that extend out over the edge of the boat and have fan type nozzles that spray a fixed pattern of dispersant, the following ASTM standards apply:
    - **ASTM F 1413-92** Standard Guide for Oil Spill Dispersant Application Equipment: Boom and Nozzle Systems.
    - **ASTM F 1460-93** Standard Practice for Calibrating Oil Spill Dispersant Application Equipment Boom and Nozzle Systems.
    - **ASTM F 1737-96** Standard Guide for Use of Oil Spill Dispersant Application Equipment During Spill Response: Boom and Nozzle Systems.
  - If the system involves the use of a fire monitor and or fire nozzle to apply the dispersants, a straight and narrow "firestream" flow of dispersant directly into the oil is to be avoided. At this time (May 2000) there are no applicable ASTM standards for these types of systems.
- If an alternative dispersant platform is used, the Operation Plan should include dispersant application guidelines.

- The FOSC is to notify the RRT as soon as practicable after the approval is given to the RP.

GO TO SECTION 13 BELOW

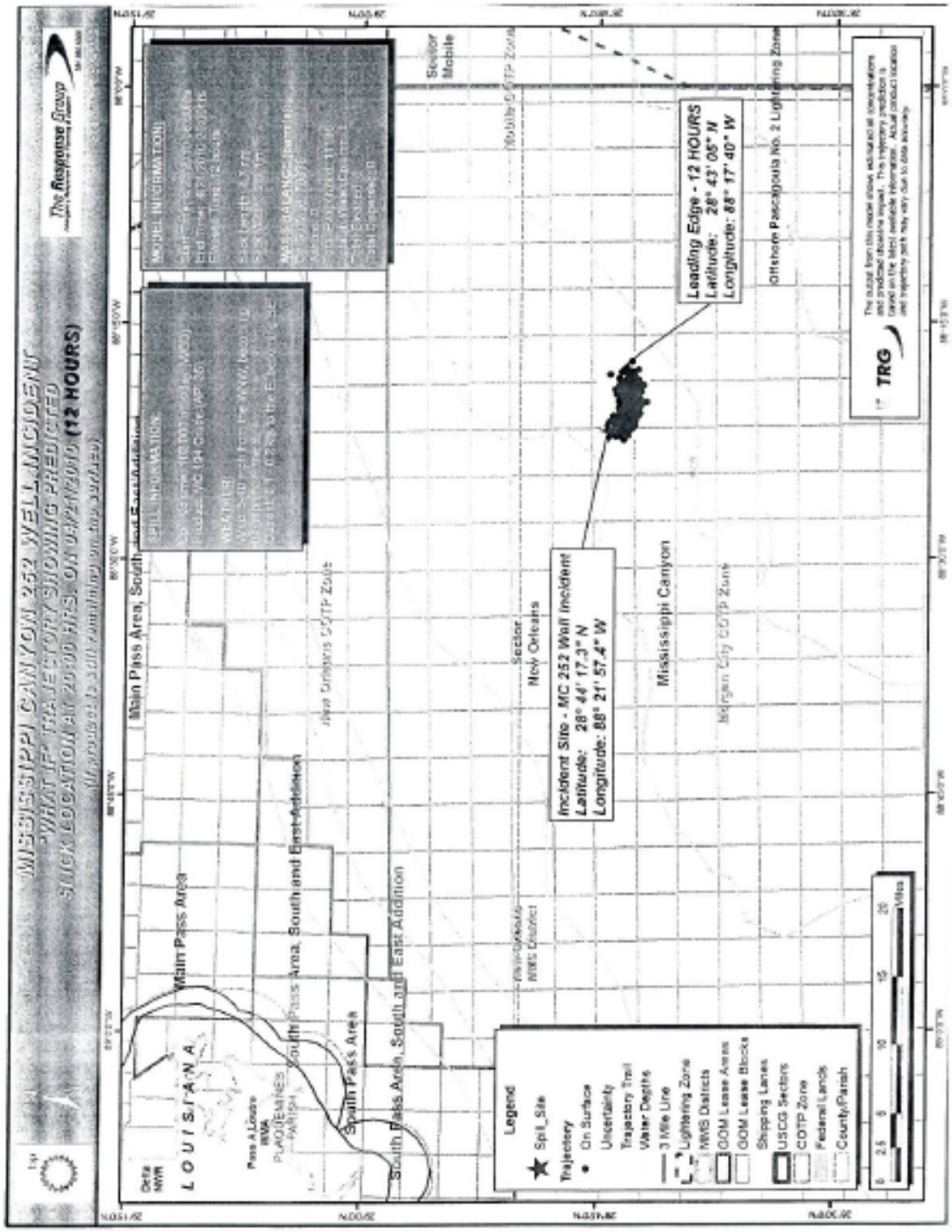
13. The RRT (EPA, DOI, DOC, and the State of Louisiana and/or the State of Texas) must be kept informed on the status of the dispersant application throughout the operation. Provided the dispersant application is successful and operational results are positive, no RRT approval will be required for additional sorties and passes.

GO TO SECTION 14 BELOW

14. At the completion of the dispersant operation, send the following to the RRT representatives:
    1. This completed Checklist
    2. The Dispersant Pre-Approval Initial Call Checklist
    3. A one page summary of the operation to date
    4. Other information as necessary

    Provide the RRT post-application information/results within 24 hours of the dispersant application. Formal convening of the RRT, however, is not necessary

    Follow-up operation by insuring that flight logs and SMART team logs are secured should RRT members request additional documentation.


MISSISSIPPI CANYON 252 WELL INCIDENT
WHAT IF TRAJECTORY SHOWING PREDICTED
SLICK LOCATION AT 2000 HRS. ON 04/29/2010 (12 HOURS)
The Response Group
MODEL INFORMATION
WEATHER
Leading Edge - 12 HOURS
Latitude: 28° 43' 05" N
Longitude: 88° 17' 40" W
Incident Site - MC 252 Well Incident
Latitude: 28° 44' 17.3" N
Longitude: 88° 21' 57.4" W
Main Pass Area, South and East Addition
Main Pass Area
South Pass Area
South Pass Area, South and East Addition
LOUISIANA
Delta NWR
Pass a Loutre WMA
PLAQUEMINES PARISH
New Orleans COTP Zone
Sector New Orleans
NOAA District
Mississippi Canyon
Morgan City COTP Zone
Sector Mobile
Mobile COTP Zone
Offshore Pascagoula No. 2 Lightering Zone
Legend
Spill_Site
Trajectory
On Surface
Uncertainty
Trajectory Trail
Water Depths
3 Mile Line
Lightering Zone
MMS Districts
GOM Lease Areas
GOM Lease Blocks
Shipping Lanes
USCG Sectors
COTP Zone
Federal Lands
County/Parish
Miles
TRG