PREASSESSMENT DATA REPORT
THE *MP-69 / HURRICANE IVAN* OIL DISCHARGES
MISSISSIPPI RIVER DELTA, LOUISIANA

- REVISED DRAFT -

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EXECUTIVE SUMMARY

High winds and waves associated passage of Hurricane Ivan on September 15-16, 2004 caused a number of discharges from damaged facilities and pipelines in the Mississippi River Delta. Response and assessment activities for the majority of these discharges were combined into a single effort because these incidents occurred at approximately the same time, oil mixing occurred, and because multiple responsible parties were involved. Response and Preassessment Phase efforts by responsible parties, state and federal trustees and contractors for eight separate incidents, including six pipeline leaks and two facility discharges, are described in this report.

The incidents can be divided into two separate categories. The first is a set of three discharges from two damaged facilities and a pipeline leak in or near North Pass. These incidents, referred to here collectively as the North Pass spills, were discovered on September 17, immediately after the passage of Hurricane Ivan. The remaining incidents were known or assumed to be offshore pipeline leaks. These discharges were discovered between September 24 and October 2 as part of ongoing response activity. The largest of these was a discharge from the Shell MP-69 Nakika 18-inch and the BP MP-69 MPOG 20-inch pipelines where the pipelines crossed. Though the volume of oil discharged is unknown, this leak was the largest and formed the focus of response activities. In general, oil from these offshore pipeline leaks was more difficult to track and recover.

Oil from the North Pass spills was largely contained within the facilities involved and the marsh shorelines and tidal flats on the north side of North Pass, along Lonesome Bayou, on the south side of North Pass, possibly further south. In general, winds and currents caused oil from the MP-69 and other offshore pipeline leaks to travel in a southeast, south, and southwestward direction. During the first week of the response, predominantly eastward winds and southern currents held most oil offshore. Shorelines were at greater risk during the second week of response as predominant westward winds were recorded.

Limited shoreline cleanup efforts included manual removal of oil from sand and mud flats and sand beaches, low-pressure flushing of oiled vegetation, and cutting of oiled vegetation. Offshore skimming, and dispersant application were conducted for the offshore pipeline leaks. Tropical Storm Matthew which made landfall in southeastern Louisiana on October 7 –10, prevented the continuation of response and cleanup activities.

In all, 7,800 linear meters (25,590 feet) of shoreline were documented as oiled during the Response Phase fieldwork on September 30 and October 4. During the Preassessment Phase fieldwork on October 20-21, 2,834 linear meters (9,298 feet) of marsh shoreline and 905 linear meters (2,969 feet) of beach shoreline were documented as oiled. This same fieldwork documented 11,657 square meters (2.88 acres) of marsh habitat and 2,081 square meters (0.51 acres) of beach habitat as oiled. These data indicate that significantly more shoreline habitat was oiled prior to the passage of Tropical Storm Matthew.

1.0 INCIDENT DESCRIPTION

1.1 Overall Descriptions

On September 15-16, 2004, Hurricane Ivan made landfall on the Alabama and Florida Gulf coasts. In Louisiana, high winds and waves associated with the category four storm caused a number of pipeline discharges from damaged facilities in the Mississippi River Delta. Response and assessment activities for the majority of these discharges were combined into a single effort because these incidents occurred at approximately the same time, oil mixing occurred, and because multiple responsible parties were involved. Eight separate incidents, including six pipeline leaks and two facility discharges, were included in the umbrella of the response and Preassessment Phase efforts (Figure 1).

On September 17, three discharges were reported in Plaquemines Parish, Louisiana and response activities were initiated. The first discharge was reported by BP employees who noticed the MP-80 Delta 20-inch pipeline owned and operated by BP was releasing Louisiana sweet crude into the bay immediately north of North Pass. The second discharge was reported by Shell Pipeline employees who discovered that a nipple was sheared off the pump station co-utilized by their company. The malfunction led to the discharge of an unknown quantity of Louisiana sweet crude into the marsh immediately adjacent to the company facility at North Pass. A third release was caused by the collapse of a 10,000 bbl storage tank during the storm. The storage tank was located at the ChevronTexaco tank farm on North Pass. At the time of the storm's passage, the tank was reported to have contained 3,100 bbl of Louisiana sweet crude. These three discharges are referred to collectively in this report as the North Pass spills.

On September 19, BP deployed 120 meters (400 feet) of boom in two rings around the pipeline release site. On September 20, the three companies worked collaboratively to deploy an additional 2,200 meters (7,000 feet) of hard and sorbent boom inside North Pass, Lonesome Bayou, and north of the pass in open water around the BP pipeline discharge. The BP pipeline discharge was the initial focus of response efforts by all three potential RPs because the leak was ongoing. Oil from all three releases in North Pass likely mixed during or after the storm, hence the cooperation among RPs during the response to contain oil in the North Pass vicinity. The effectiveness of the boom was hampered by high winds and seas that ranged from 5 to 8 feet. Wind and high water conditions also hampered the ability of cleanup crews to safely access the release sites.

On September 23, a fourth discharge was reported as an offshore pipeline leak farther north of North Pass approximately 5.6 km (3.5 miles) north of the MP-80 pipeline discharge. The slick was estimated at 0.8 by 9.6 km (0.5 by 6 miles) and was discovered at 1600 hours during an overflight. The source of this discharge was initially unknown. As response activities continued, the source of this discharge was identified as the point where the Shell MP-69 Nakika 18-inch and the BP MP-69 MPOG 20-inch pipelines crossed. Response activities were not conducted on September 23 because of high winds and seas from three to six feet.. Though response activities were halted due to adverse weather, Shell requested approval for dispersant application by the RRT team because the amount of oil on the water's surface was substantial and there was particular concern for oiling of birds using sand islands at the mouth of North Pass. On September 24, skimming operations were initiated with the response vessels M/V

Mississippi Responder and M/V Louisiana Responder. On September 25 and 26, dispersant was applied from a surface vessel. Dive operations to repair the pipelines began on September 26 and continued for nearly two weeks. On September 29 and again on October 3, dispersant was applied via aircraft. The discharge resulting from the leaks in the Shell MP-69 Nakika 18-inch and the BP MP-69 MPOG 20-inch pipelines had the greatest volume.

On September 30, a fifth discharge caused by an offshore pipeline leak from the Shell MP-151 Nakika 18-inch pipeline in the vicinity of MP-69 described above was discovered. Overflight reports described a heavy rainbow-colored sheen with limited streaking black oil 5 to 10 meters (15 to 30 feet) wide by several miles long. On October 1, a sixth discharge caused by an offshore pipeline leak from the Shell MP-70 Cobia 12-inch pipeline was discovered. The reported size of the leak was small compared to the quantities of oil released from the other incidents. The pipeline was depressurized and response activities were carried out as part of the larger MP-69 discharge response

Finally, on October 2, two additional discharges were reported. A bubbling source, apparently a pipeline leak, was observed offshore north of North Pass, between the MP-80 and the MP-69 discharges. On the same date, oil was reported floating along the terminal end of the east side of Southwest Pass. It is unclear whether oil in Southwest Pass was the result of a separate discharge, or whether the oil was from one of the aforementioned discharges. Response activities for both of the above discharges, termed the Mystery Pipeline Leak and the Mystery Spill near Southwest Pass, were carried out as part of the larger MP-69 Spill response. Collectively, the MP-69 and other offshore pipeline leaks are referred to as the offshore pipeline spills.

The passage of Hurricane Ivan caused other discharges in the Mississippi River Delta, including the discharge referred to as the Raphael Pass Facility Spill. These incidents were considered separately and were not covered by this report.

The National Response Center (NRC) public reports contain descriptions of other incidents in the same time period with both known and unknown responsible parties. The dates included in this report were those when incidents became known to the Unified Command Center (UCC). In some cases, NRC reports predate when those presumably same discharges were reported to the UCC.

Table 1. Summary of incidents included as part of the MP-69/Hurricane Ivan spill response and Preassessment Phase activities, with incident group name.

SPILL	**GROUP**
Shell Facility Spill	North Pass spills
Chevron-Texaco Tank Collapse Facility Spill	North Pass spills
BP MP-80 Delta 20 inch Pipeline Spill	North Pass spills
Shell MP-70 Cobia 12 inch Pipeline Leak	Offshore pipeline spills
Shell/BP MP-69 Nakika 18 inch/MPOG 20 inch Pipeline Leak	Offshore pipeline spills
Shell MP-151 Nakika 18 inch Pipeline Leak	Offshore pipeline spills
Mystery Spill near Southwest Pass	Offshore pipeline spills
Mystery Pipeline Leak	Offshore pipeline spills

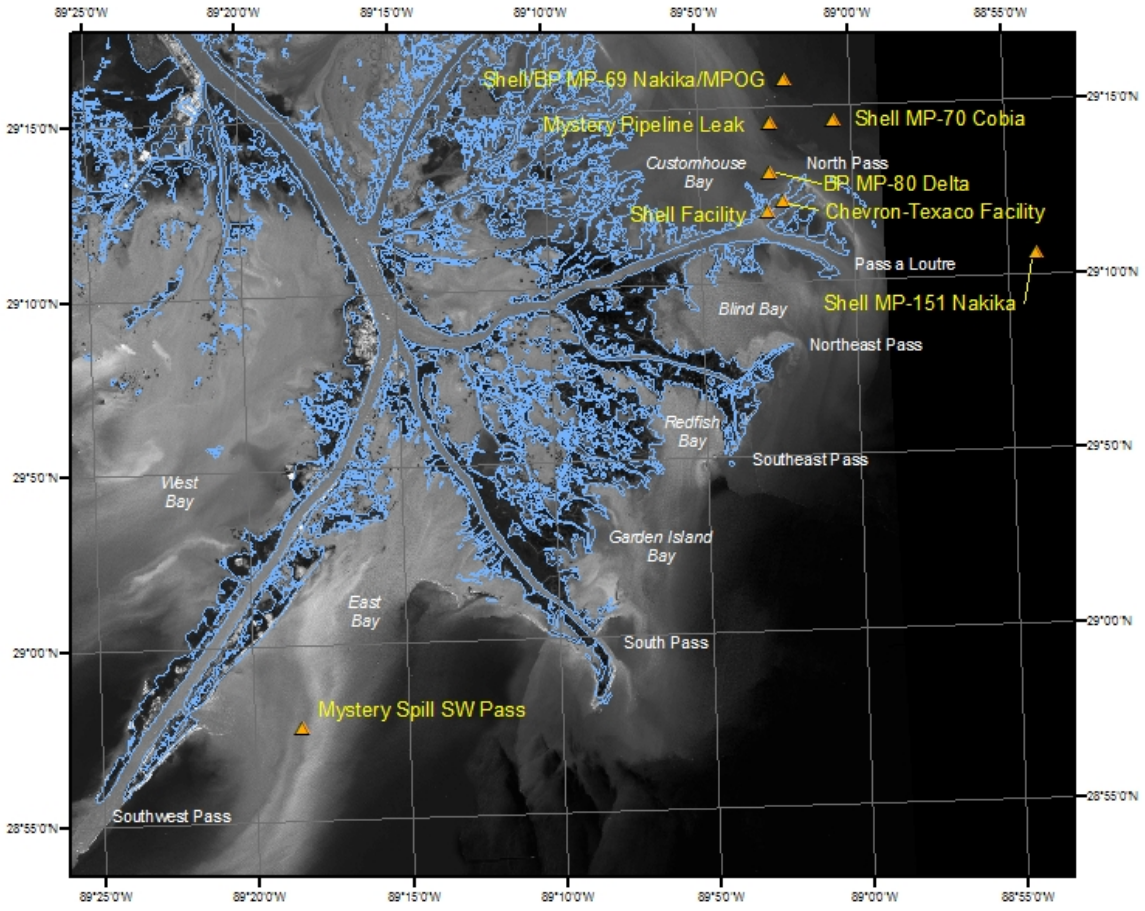


Figure 1. Incident location summary map for Hurricane Ivan Spills.

Preliminary shoreline cleanup assessment team (SCAT) surveys were conducted by RP contractors on September 19 and September 26 – 28 in the area immediately adjacent to the North Pass Spills. Additional SCAT surveys were conducted by the RP, CK & Associates, and NOAA on October 4 in the same area, as well as the vicinity of Southeast and Northeast Passes. Marshes along the outer portions of the Mississippi River Delta are primarily composed of *Phragmites australis* (known locally as roseau cane or also referred to as *P. communis)* with limited occurrences of *Typha spp.* (cattails). Of note during all SCAT surveys was the extensive physical damage to marshes, as well as plant chlorosis, presumably caused by physical exposure and high ambient water salinities during Hurricane Ivan. Cooperative guidelines for preassessment surveys for Natural Resource Damage Assessments (NRDA) were jointly developed by federal and state resource trustees and RP's during the week of October 10–17. During October 19 – 21, cooperative preassessment NRDA aerial and ground surveys were conducted by joint teams to better document the spatial extent and severity of oiling from the eight incidents.

Active booming and cleanup efforts in the vicinity of the North Pass spills occurred from September 19 to October 6. Cleanup efforts included manual removal of oil from sand and mud

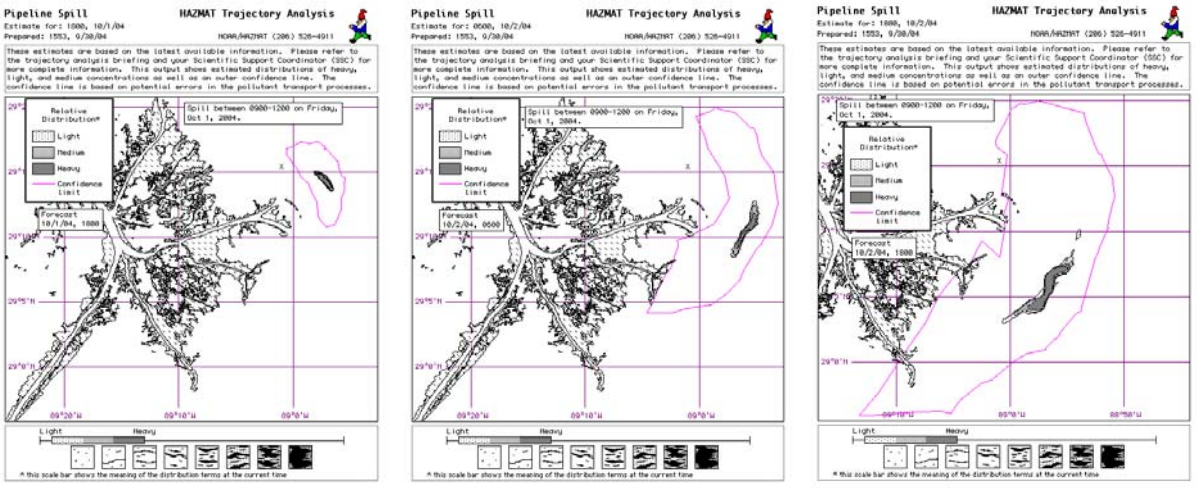
flats and sand beaches, low-pressure flushing of oiled vegetation, and cutting of oiled vegetation. Oil and oiled debris removal was conducted on the beaches along the south side of Southwest Pass. Active pipeline repair, skimming, and dispersant application were conducted during this same time period for the MP-69 spill and other offshore pipeline leaks. During October 7–10, Tropical Storm Matthew made landfall in southeastern Louisiana. This storm resulted in high wind and wave conditions and extensive coastal flooding, which prevented the continuation of response and cleanup activities. After the passage of Tropical Storm Matthew, all active response and cleanup operations were halted, although pipeline repair operations and other activities were ongoing.

1.2 Trajectory Information

Trajectory information for all discharges immediately after the passage of Hurricane Ivan was unavailable because high winds, waves, and current conditions associated with the storm's passage caused high model uncertainty. Oil spilled at the Shell Facility was believed to be largely localized within the facility and the marshes and waterways immediately adjacent to it. Oil discharged from the ChevronTexaco facility during the height of the hurricane was believed to have affected the marshes and waterways immediately across Pass a Loutre and in the general vicinity of the tank farm. The oil spilled at the BP MP-80 Delta 20 inch pipeline spill was thought to have come ashore largely along the marsh shorelines and tidal flats on the north side of North Pass, along Lonesome Bayou, and on the south side of North Pass, in the area known as Middle Ground between North Pass and Pass A Loutre. This information was derived largely from the location of response and cleanup activities (Figure 2) and overflight photos. Anecdotal reports indicated that floating oils and sheens from these spills were present in the waters and along the shorelines of Pass A Loutre and the northern portions of Blind Bay (located south from Pass a Loutre).

Figure 2. Diagram of RP response plan for North Pass spills area.

Trajectory information for the Shell/BP MP-69 Nakika 18-inch/MPOG 20 inch pipeline leak was derived primarily from overflight monitoring and trajectory modeling conducted by NOAA Hazmat. In general, winds and currents caused oil from the MP-69 and other offshore pipeline leaks to travel in a southeast, south, and southwestward direction. Currents flowed in a southern direction because of the Mississippi River discharge and bathymetric contours east of the Delta. During the first week of the response, predominantly eastward winds and southern currents held most oil offshore. Shorelines were at greater risk during the second week of response as predominant westward winds were recorded. Figure 3 shows the output of trajectory modeling efforts for a hypothetical quantity of oils spilled at the MP-69 spill site for three time steps over a two-day period. This pattern of movement was characteristic for oil spilled from the offshore pipeline leaks over the majority of the response.



A. **B.** **C.**

Figure 3. G-NOME model oil trajectory predictions provided by NOAA Hazmat based upon a single spill at the MP-69 location occurring between 0900-1200 on October 1 at three time steps: 1800 October, 1; 0600, October 2; and 1600 October 2.

1.3 Overflight Maps

While reconnaissance overflights were conducted daily during the response, maps derived from these overflights were limited to a few dates, shown in Figures 4 and 5. In general, the data from these overflights support the conceptual model for floating oil movement during the period of interest developed from verbal reports and trajectory modeling. Specifically, oil from the offshore pipeline leaks (see Table 1) was typically found to move southward and southwestward in wide bands of rainbow sheen and dark brown slicks. This oil was known to have come ashore in the form of both sheens and black oil at the mouths of Pass A Loutre,

Northeast and Southeast Passes, and South Pass. This oil was reported to have come ashore in Blind Bay, Redfish Bay, and Garden Island Bay, primarily as sheens, and penetrated the interior marsh of the Delta.

While identifying floating oil and sheens was possible, field personnel found identifying the spatial extent and degree of oiling on marsh shorelines difficult during overflights. Overflights typically occurred from helicopters at altitudes higher than 150 meters (500 feet). At that altitude, distinguishing oiled marsh from non-oiled marsh with detrital matter (known locally as "coffee grounds") and saline scorched submergent vegetation was extremely difficult. *Phramites* forms a dense canopy making oiling at the base or mid-stem difficult to view from the air. In addition, canes were horizontally flattened, potentially hiding oil beneath the mat that was formed. Even at lower altitudes, shoreline oiling was difficult to evaluate from the air. Overflights were most useful in delineating the spatial extent of offshore oil and supporting trajectory modeling.

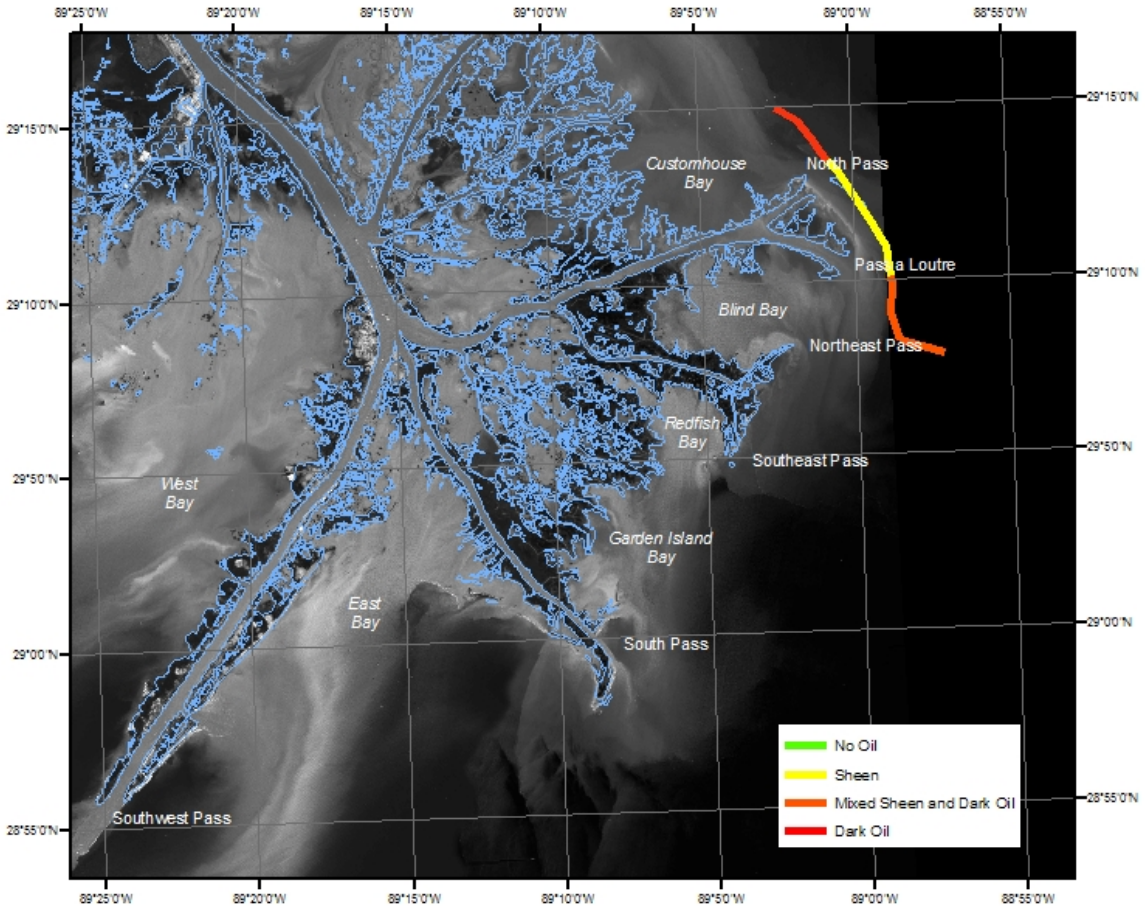


Figure 4. Overflight summary map derived from data collected on September 30, 2004.

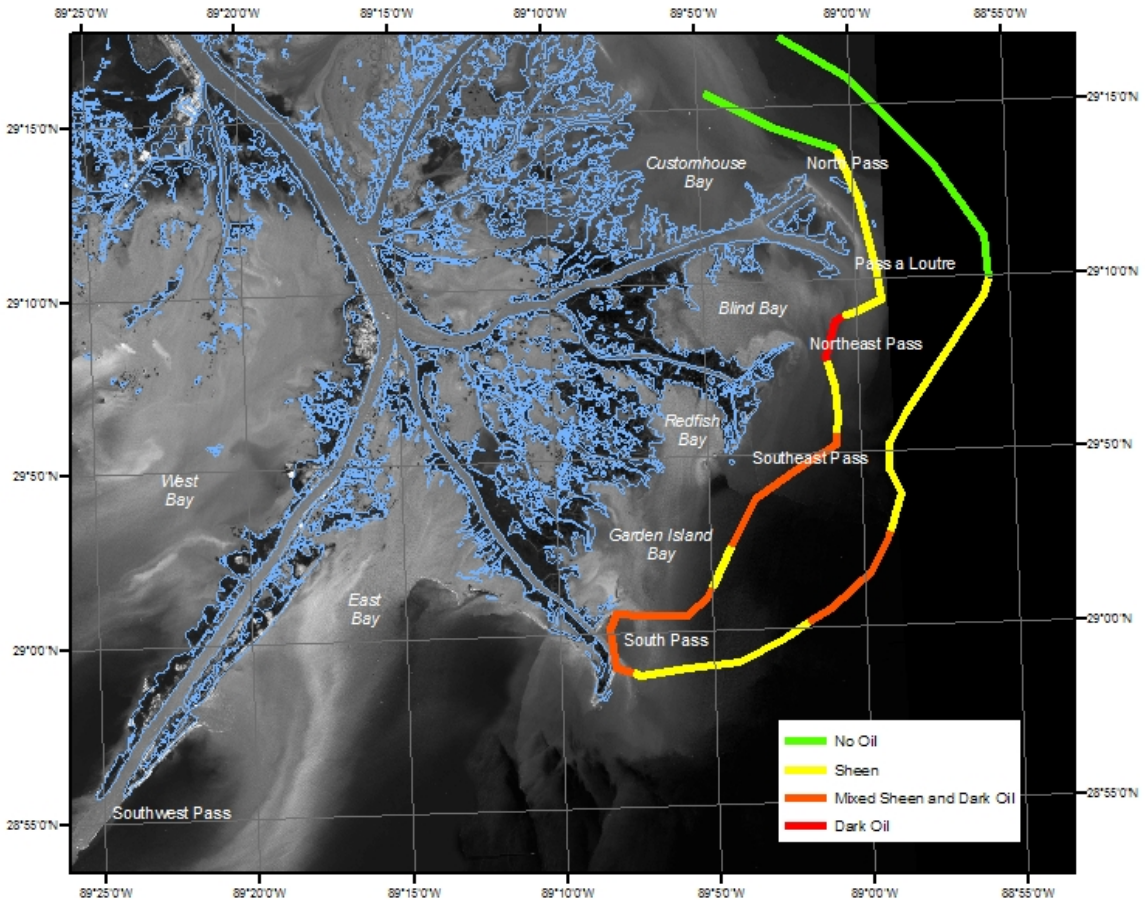


Figure 5. Overflight summary map derived from data collected on October 4, 2004.

1.4 Timeline of Events

Due to the multiple spills, interrelated weather events, and complex nature of the response, it is helpful to examine a timeline of spills, response activities, SCAT fieldwork and weather events (Figure 6). It is assumed that most pipeline leaks began during Hurricane Ivan and continued until repairs were completed.

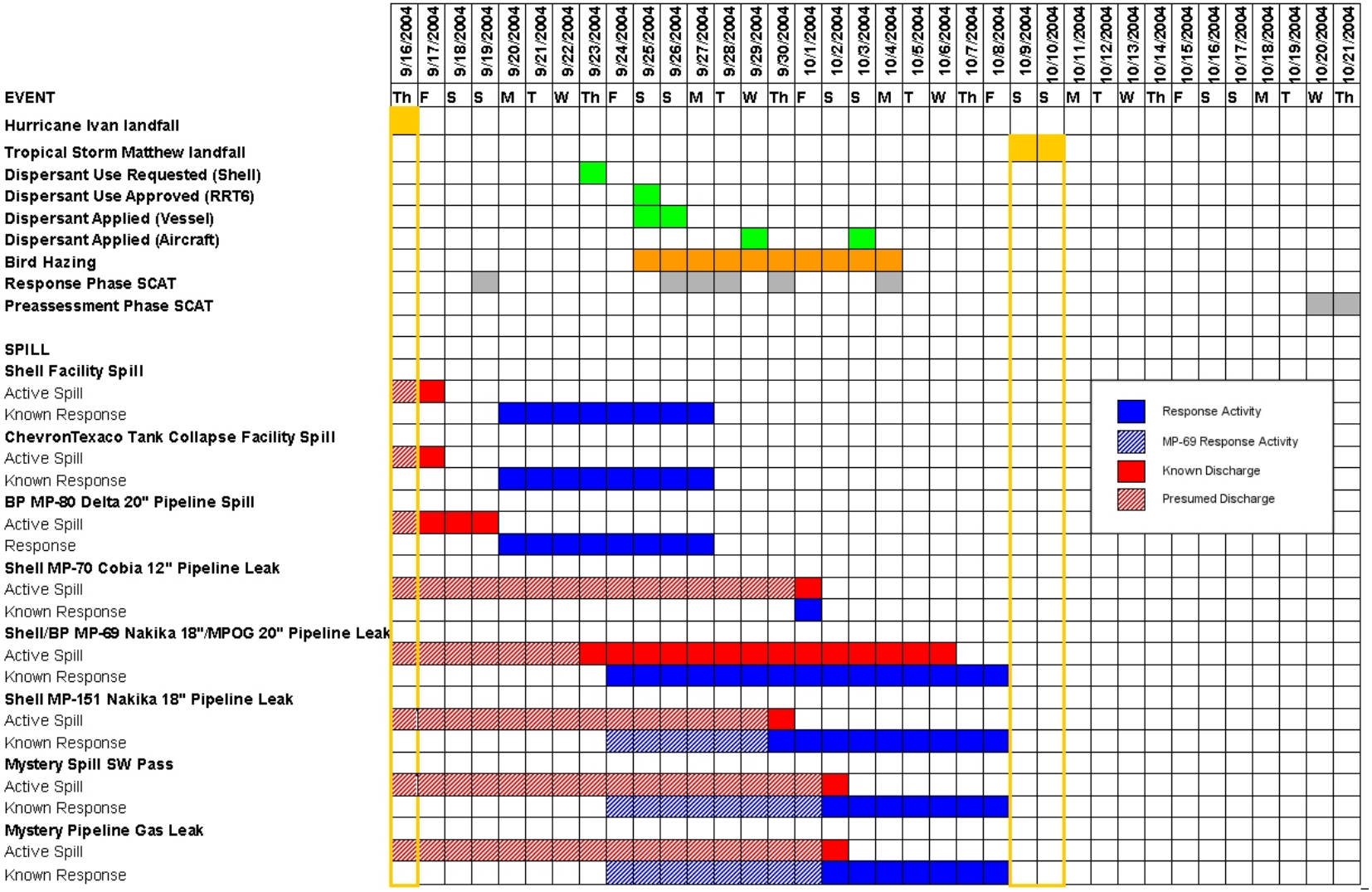


Figure 6. Timeline of incidents and major events detailed in this document. Yellow indicates storm events, green indicates dispersant related activities, orange indicates bird hazing activities, grey indicates SCAT related activities, blue indicates response activities, and red indicates active spills. Note that red hatch indicates an assumed unobserved ongoing spill, and blue hatch indicates response activities carried out for the main MP-69 offshore spill that may have been applicable to the other offshore spills.

1.5 Representative Response Phase Photos

Included below in Figures 7-15 are representative photos from the response phase. Note that there are no photographs of the MP-70 pipeline leak or the mystery spills. The response for those incidents was combined into the larger MP-69 offshore pipeline spill response.

Figure 7. ChevronTexaco Facility (9/30/04).

Figure 8. Shell Facility (9/27/04).

Figure 9. Offshore skimming operations at MP-80 (9/25/04).

Figure 10. Overview for North Pass spills looking NE along North Pass (9/25/04).

Figure 11. **Marsh oiling from North Pass spills on south shore of North Pass (10/4/04).**

Figure 12. Marsh oiling from North Pass spills (10/4/04).

Figure 13. Offshore skimming operations at MP-69 (9/29/04).

Figure 14. **MP-151 (9/30/04).**

Figure 15. Bands of oil and sheen coming onshore between Northeast and Southeast passes (10/3/04).

2.0 PROPERTIES OF THE DISCHARGED OIL

Though no chemical analysis of source oils was conducted, all discharged oils were reported to be South Louisiana Crude. In general, south Louisiana crude has the following properties:

Table 2. General properties of south Louisiana crude oil.

API Gravity	37
Density	0.839 grams/cubic centimeter
Pour point	16 degrees F
Viscosity of fresh oil	4.30 cSt at 100 degrees F

South Louisiana crude (SLC) is considered to be a medium crude oil although, with an API gravity of 37, which is on the light side of the range. The n-alkane distribution from a South Louisiana crude reference sample obtained during another spill is shown in Table 3. Note that 65 percent of the quantified alkanes are in the range of C10-C18. These compounds degrade very quickly, and SLC is known to degrade rapidly when spilled. The polynuclear aromatic hydrocarbons (PAH) typically range from 6,000 - 8,000 parts per million, which relatively low, compared to many other crude oils (average of 19 light crude oils is 12,721 ppm; average of six heavy crude oils is 15,000 ppm; source: NRC 2002 report Oil in the Sea III). Furthermore, 66% of the PAH are 2-ringed aromatic hydrocarbons. PAH data from two different SLC reference oils obtained from other spills are shown in Figure 16. These are the most volatile and water soluble, and they contribute to much of the acute toxicity of the oil to aquatic resources. SLC tends to rapidly degrade when spilled, as long as the oil remains on the surface (not buried in sediments) where natural microbial degradation is not limited by oxygen or nutrients.

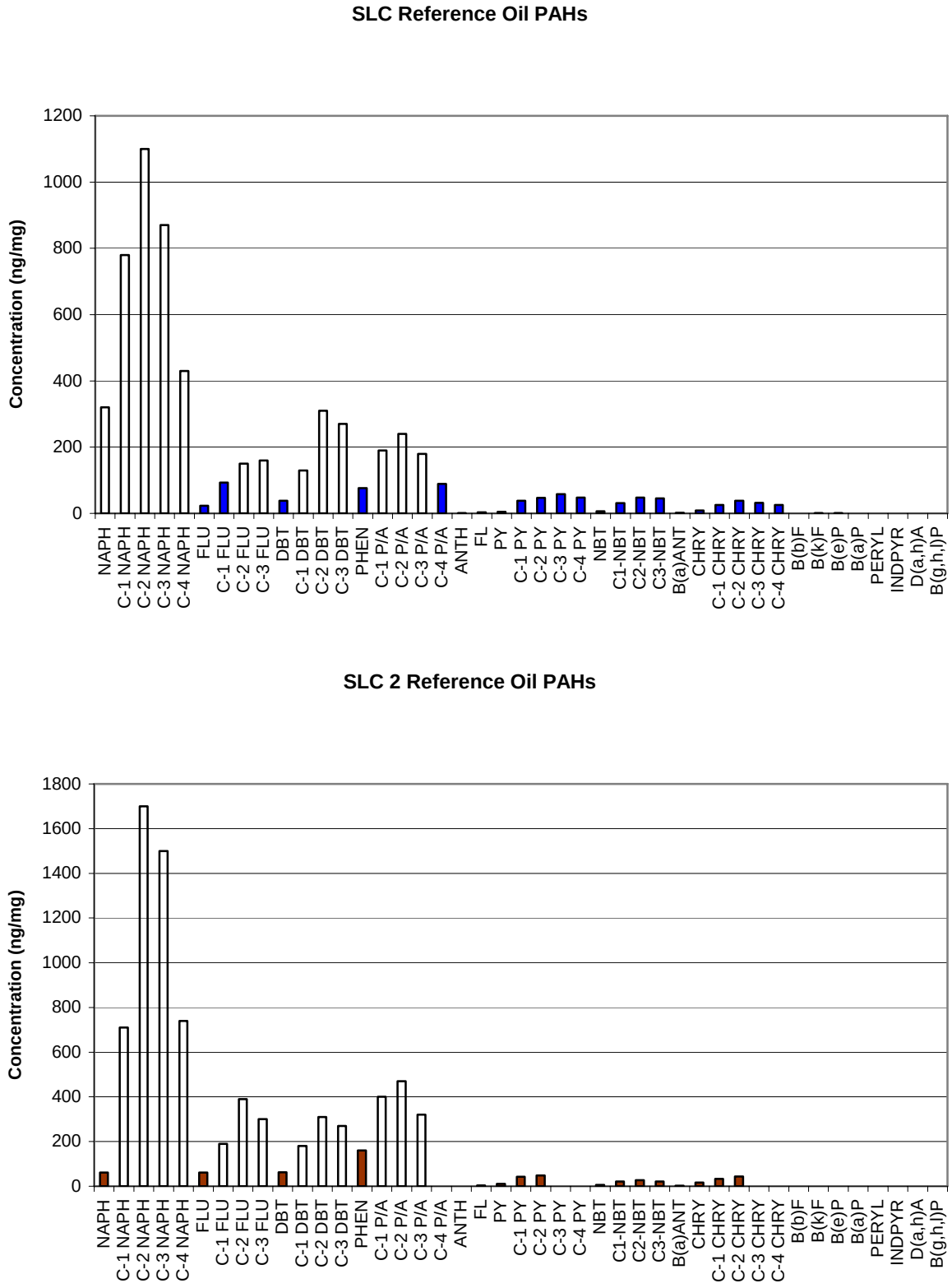


Figure 16. PAH data from two different SLC reference oils obtained from other spills .

Table 3. Composition of a south Louisiana crude reference oil.

ALKANES	Conc (ng/mg)	PAHs	Conc (ng/mg)
nC-10 Decane	3600	Naphthalene	320
nC-11 Undecane	3400	C-1 Naphthalene	780
nC-12 Dodecane	3100	C-2 Naphthalene	1100
nC-13 Tridecane	2700	C-3 Naphthalene	870
nC-14 Tetradecane	2500	C-4 Naphthalene	430
nC-15 Pentadecane	2400	Fluorene	23
nC-16 Hexadecane	2100	C-1 Fluorene	93
nC-17 Heptadecane	1800	C-2 Fluorene	150
Pristane	1200	C-3 Fluorene	160
nC-18 Octadecane	1400	Dibenzothiophene	38
Phytane	920	C-1 Dibenzothiophene	130
nC-19 Nonadecane	1300	C-2 Dibenzothiophene	310
nC-20 Eicosane	1500	C-3 Dibenzothiophene	270
nC-21 Heneicosane	1200	Phenanthrene	76
nC-22 Docosane	1100	C-1 Phenanthrene	190
nC-23 Tricosane	960	C-2 Phenanthrene	240
nC-24 Tetracosane	910	C-3 Phenanthrene	180
nC-25 Pentacosane	1100	C-4 Phenanthrene	89
nC-26 Hexacosane	1000	Anthracene	0.74
nC-27 Heptacosane	710	Fluoranthene	3.2
nC-28 Octacosane	640	Pyrene	4.7
nC-29 Nonacosane	490	C-1 Pyrene	38
nC-30 Triacontane	620	C-2 Pyrene	47
nC-31 Hentriacontane	630	C-3 Pyrene	58
nC-32 Dotriacontane	410	C-4 Pyrene	48
nC-33 Tritriacontane	300	Napthobenzothiophene	6.5
nC-34 Tetratriacontane	180	C-1 NBT	31
nC-35 Pentatriacontane	200	C-2 NBT	48
TOTAL ALKANES	***38371***	C-3 NBT	45
		Benzo (a) Anthracene	1.8
		Chrysene	8.4
		C-1 Chrysene	25
		C-2 Chrysene	38
		C-3 Chrysene	32
		C-4 Chrysene	25
		Benzo (b) Fluoranthene	0.35
		Benzo (k) Fluoranthene	0.60
		Benzo (e) Pyrene	1.1
		Benzo (a) Pyrene	0.25
		Perylene	0.16
		Indeno (1,2,3 - cd) Pyrene	nd
		Dibenzo (a,h) anthracene	nd
		Benzo (g,h,i) perylene	nd
		TOTAL PAHs	***5913***

3.0 MASS BALANCE

3.1 List of Responsible Parties and Reported Amounts Lost

The quantity of oil spilled from most of the incidents is still unknown. Spill volume estimates were not available in most cases because these incidents occurred in a remote area and were caused or affected by several major storm events. For those leaks that were associated with submersed pipelines, estimating spill volumes and duration was especially difficult. Table 4 summarizes the incidents covered by this report and the volumes of oil spilled, where known. Note that the MP-69 spill was reported to be leaking at a rate of 16 bbl per hour on September 29. It is unknown if this flow rate is characteristic of the leak for its entire duration. On October 4, data posted at Incident Command indicated that 3,450 bbl of material (not pure oil) had been recovered by skimming operations.

On February 23, 2005, the Minerals Management Service contacted NOAA regarding estimated discharge volumes for several incidents. The discharge volumes reported by MMS represent the RPs' best estimates for the entire incident. The estimates were provided individually by Shell and BP at the request of the MMS and they are based on the RPs' best available information, including but not limited to the amount of oil recovered during the response. The Nakika 18" Pipeline (includes both MP-69 and MP-151 locations) discharged 4,528 barrels of crude oil. The Delta 20" Pipeline (includes MP-80 location only) discharged 7,058 barrels of crude oil (pers. comm., R. Wright, MMS).

Regional news coverage of the incident and spill volume estimates were sparse. The NOAA injury assessment coordinator for Louisiana collected three articles from regional newspapers. Approximately a week after the incident was reported, the New Orleans Times-Picayune reported that the spill volume of the ruptured Shell pipeline was unknown and that the pollution was contained (September 26, 2004, Times Picayune). The Times-Picayune reported that one oiled pelican was recovered and cleaned (September 26, 2004, Times Picayune). On October 7, 2004, The Advocate reported field crews had gathered about 101,000 gallons of water polluted with oil. The estimate of polluted water was released by the U.S. Coast Guard and Minerals Management Service (October 7, 2004, The Advocate). The article cites Caryl Fagot, the MMS spokesperson, who was reported to have said that no major pollution occurred in federal waters. A third article in the Tampa Tribune did not provide spill volume estimates but detailed response efforts to the Shell and BP pipelines and noted several rigs were ripped from their moorings (October 28, 2004, Tampa Tribune). A NRC incident summary reported that oil discharge volume was between 12,600 to 21,000 gallons (300 to 500 bbls). A Coast Guard Press Release dated October 7, 2004 indicated that 201,600 (4,800 bbl) gallons were collected by contracted skimming vessels. Approximately 211,638 gallons (5,039 bbl) of oily water was collected using other recovery methods.

Table 4. Summary of incidents included as part of the MP-69/Hurricane Ivan spill response and Preassessment Phase and reported estimates of spilled volumes.

SPILL	VOLUME
Shell Facility Spill	Unknown
Chevron-Texaco Tank Collapse Facility Spill	3100 bbl
BP MP-80 Delta 20" Pipeline Spill	7,058 bbl
Shell MP-70 Cobia 12" Pipeline Leak	Unknown
Shell/BP MP-69 Nakika 18"& Shell MP-151 Nakika 18" Pipeline Leak	4,528 bbl
MPOG 20" Pipeline Leak	Unknown
Mystery Spill near Southwest Pass	Unknown
Mystery Pipeline Leak	Unknown

3.2 Amount of Oil Recovered

The amounts of oil and oiled debris recovered from skimming and shoreline cleanup operations were not readily available for most incidents or not directly comparable. It was reported on September 30 that 656 bbl had been collected by on-water skimming operations. On October 4, data posted at Incident Command indicated that 3,450 bbl of material (not pure oil) had been recovered by skimming operations. The correlation between discharge volumes estimated during the response and those estimated after the incident was unclear.

3.3 Dispersant Application Summary

Shell requested dispersant application for the Shell/BP MP-69 Nakika 18"/MPOG 20" Pipeline Leak on the same day it was reported. Approval was granted by the Region 6 Regional Response Team (RRT) on September 25. In general, operational decisions regarding the application of dispersant were driven by threats to concentrations of birds on the flats adjacent to the mouths of North Pass, Pass A Loutre, and Southeast Pass, as in Figure 19. Throughout the course of the response, concentrations of over 2,000 birds were routinely reported at these locations. On the evening of September 25 to early morning on September 26, 1,325 liters (350 gallons) of Corexit 9500 were applied via surface vessel. Limited visibility hampered the monitoring of effectiveness. On September 29, 7,560 liters (2,000 gallons) of Corexit 9500 were applied via two DC-3 sorties. Dispersant activities were limited to waters greater than 10 meters in depth, though not exclusively Federal waters. The application was monitored visually, though calm conditions reduced mixing and prevented conclusive assessments of effectiveness. On October 3, an unknown quantity of dispersant was applied via three DC-3 sorties. Dispersant activities targeted specific slicks and, in some cases, occurred in shallow nearshore waters, shown in Figures 17 and 18. The application was monitored visually and reported to effectively reduce the volume of visible floating black oil. Due to the tactical use of dispersants to target particular slicks of floating oil threatening particular concentrations of birds, on-water SMART monitoring was unable to be deployed.

Figure 17. Dispersant application (10/3/04).

Figure 18. Slick targeted for dispersant application (10/3/04).

Figure 19. Concentrations of birds on flats near mouth of North Pass (9/25/04).

4.0 SHORELINE ASSESSMENT

As mentioned above, response-phase SCAT surveys were conducted by RP contractors on September 19 and during September 26 – 28. The cooperative RP-federal team also performed response-phase SCAT surveys on October 4. This response phase fieldwork primarily

served as reconnaissance and to guide cleanup operations. During October 20 – 21, cooperative preassessment NRDA surveys were conducted by joint teams. NRDA surveys served to document the extent and degree of residual shoreline oiling. Standard methods and terminology (Table 5) were used to describe and quantify the degree of shoreline oiling. These data were recorded on forms (Attachment A) and via GPS units. The initial shoreline surveys were conducted by foot or by boat. The shoreline assessment data were used to estimate the length and areal extent of oiling for the different shoreline habitats. NRDA assessment activities occurred after Tropical Storm Matthew had passed through the area.

During the cooperative preassessment NRDA surveys, field teams collected standardized information regarding shoreline habitat and oiling conditions. Such information was collected via data collection forms and as a data dictionary in a customized data collection application used in conjunction with GPS units. The GPS units were used to generate both point locations at points representative of shoreline conditions or features of interest, as well as trackline features to record field team location during the day. Shoreline habitat and oiling condition was recorded as attributes for both points and lines. These lines were used to calculate shoreline oiling lengths along with other oiling information.

Table 5. Standardized data types and terminology used for cooperative preassessment NRDA surveys.

HABITAT TYPE	**Unvegetated**	Beach (sand), exposed or sheltered
		Mudflat, exposed or sheltered
		Shell Beach, exposed or sheltered
		RipRap, exposed or sheltered
		Mud scarp (cut), exposed or sheltered
		Other, exposed or sheltered
	Vegetated	*Phragmites* marsh
		Spartina marsh
		Sagittaria marsh
		Submerged Aquatic Vegetation (SAV)
		Scrub/Shrub
		Floating (e.g., hyacinth)
		Other
CONDITION DESCRIPTORS		Blown Down
		New Growth
		Dead
		Chlorosis
		Healthy
OILING DESCRIPTORS	**Oiling**	Absent
		Stain/Film; does not rub off, may have odor
		Coat (Light); can rub off, may have odor
		Sheening (Moderate)
	Banding	Band width (vertical band width)
		Band height (distance above substrate)
		Penetration (horizontal band width)

5.0 SHORELINE HABITATS AFFECTED BY THE SPILL

5.1 Maps of Response Phase SCAT Coverage and Results

Figure 20 depicts the results of response phase SCAT fieldwork undertaken on September 30 and October 4. GPS units were used to record tracklines of field teams and shoreline oiling condition. These data were then used to generate maps of shoreline condition. Lines in these maps do not represent actual shoreline location, but rather that path of the boat or airboat used to survey the shorelines. The terminology used to describe oiling during this fieldwork was not consistent. As such, all oiled shorelines are described using the "stain/film" classifier, though it is likely that many oiling categories were encountered.

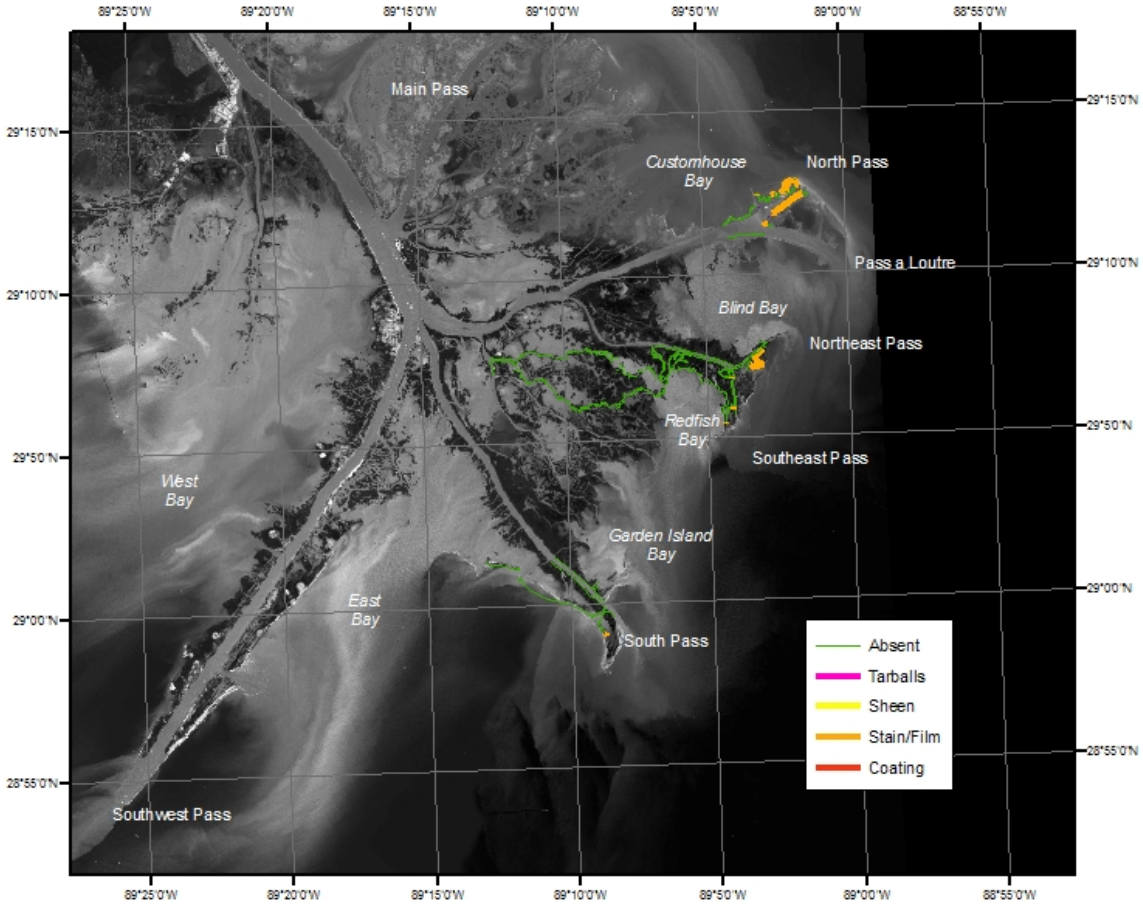


Figure 20. Response Phase SCAT coverage and results from fieldwork undertaken on September 30 and October 4. Note that oiling is all described as stain/film though actual oil type is unknown.

5.2 Maps of Preassessment NRDA Survey Coverage and Results

Figure 21 depicts the results of Preassessment Phase SCAT fieldwork undertaken on October 20-21. GPS units were used to record tracklines of field teams and shoreline oiling condition. These data were then used to generate maps of shoreline condition. Lines in these maps do not represent actual shoreline location, but rather that path of the boat or airboat used to survey the shorelines. The terminology used to describe oiling during this fieldwork was as indicated in Table 5.

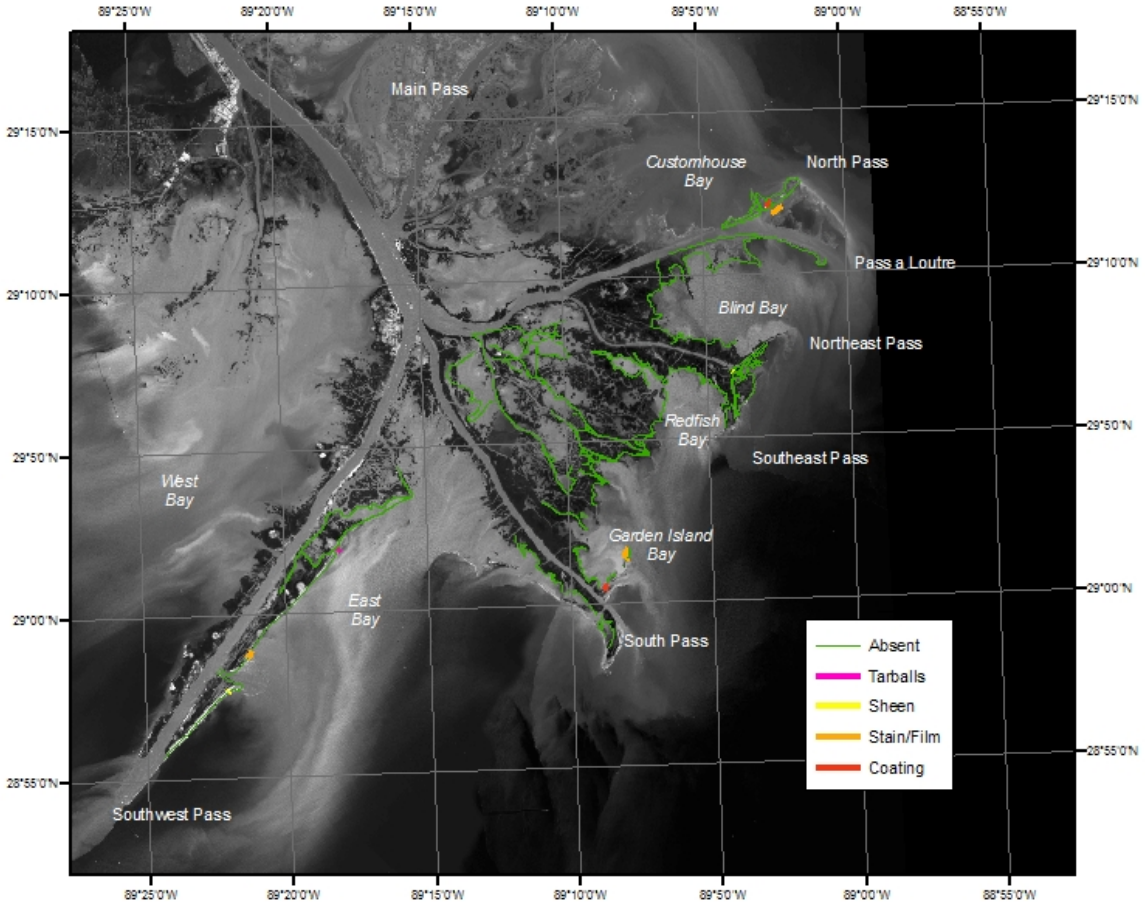


Figure 21. Preassessment Phase SCAT coverage and results from fieldwork undertaken on October 20-21.

Figures 22-23 contain details of the above map.

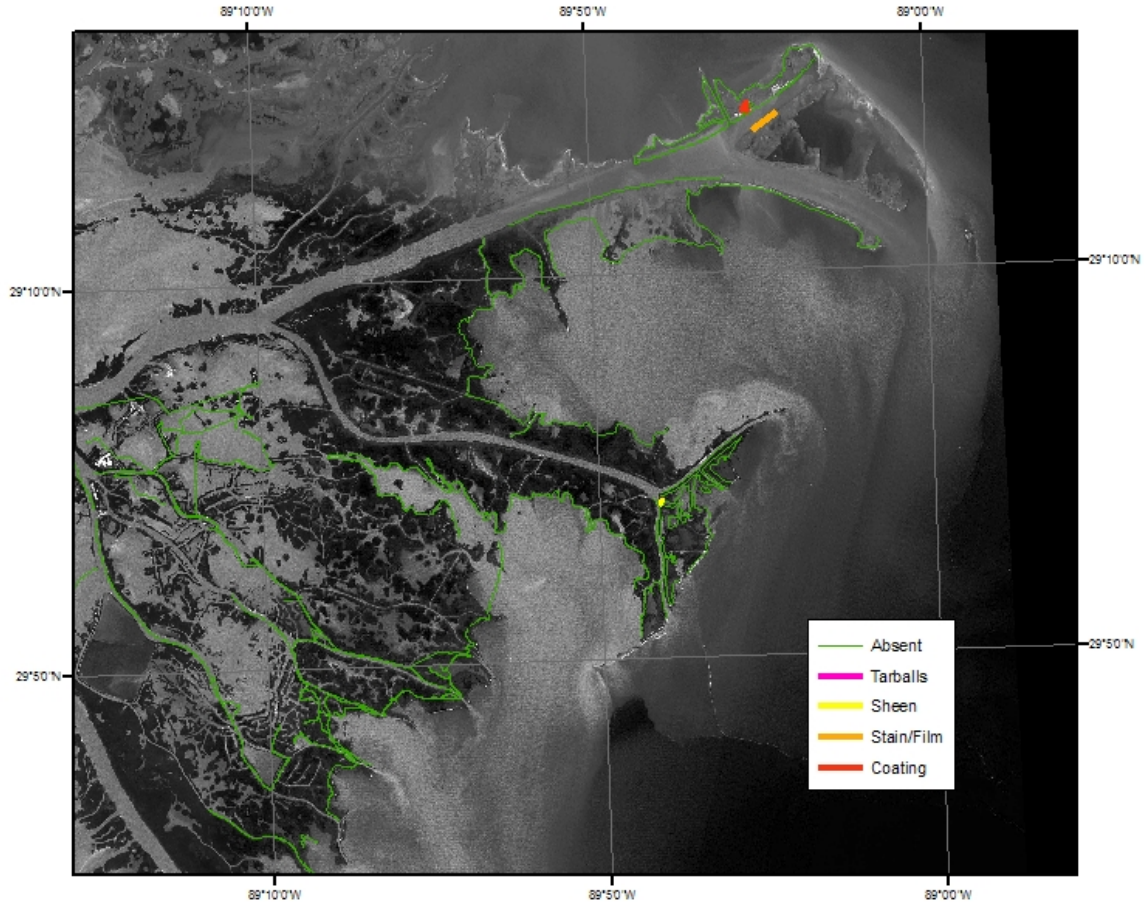


Figure 22. Preassessment Phase SCAT coverage and results detail – North Pass, Pass A Loutre, Northeast, and Southeast Passes .

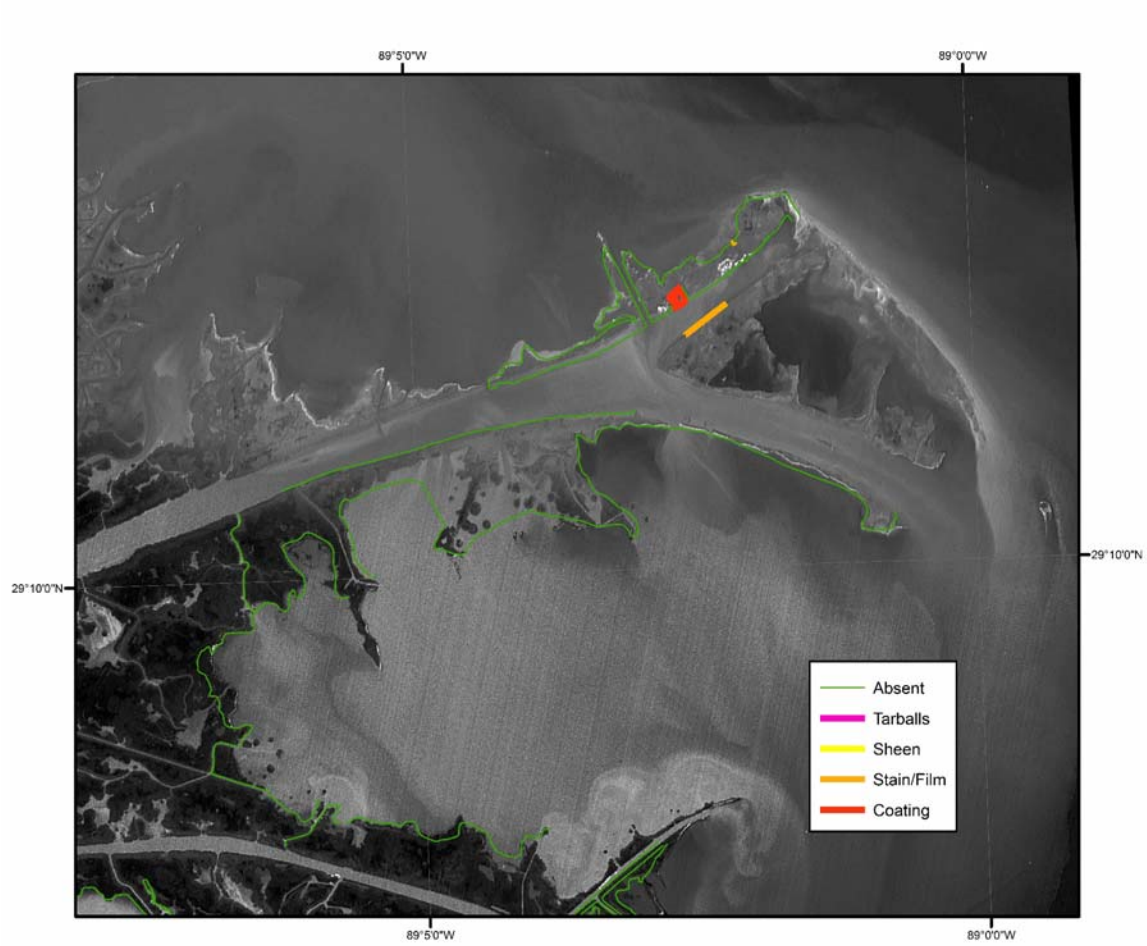


Figure 22A. Preassessment Phase SCAT coverage and results detail – North Pass and Pass A Loutre.

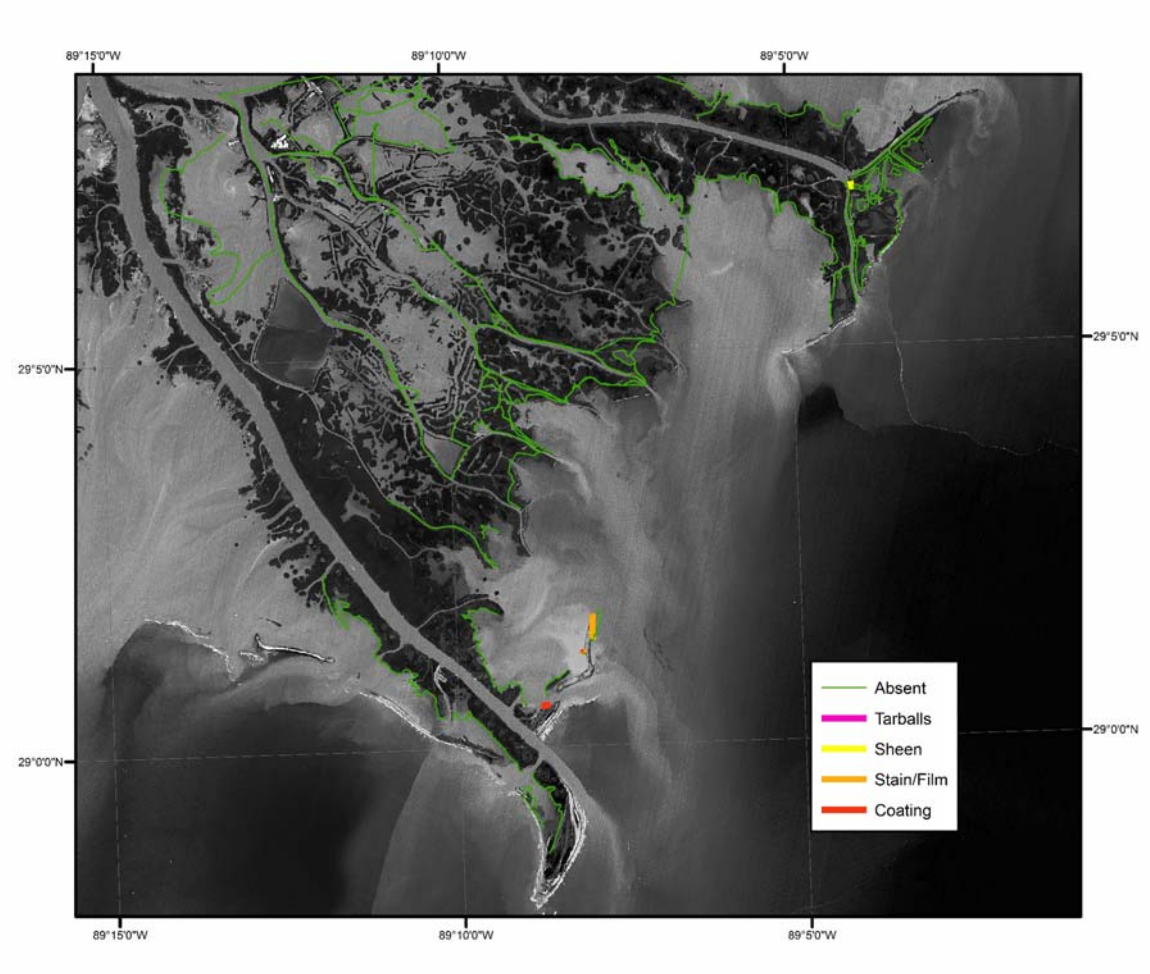


Figure 22B. Preassessment Phase SCAT coverage and results detail – Northeast and Southeast Passes .

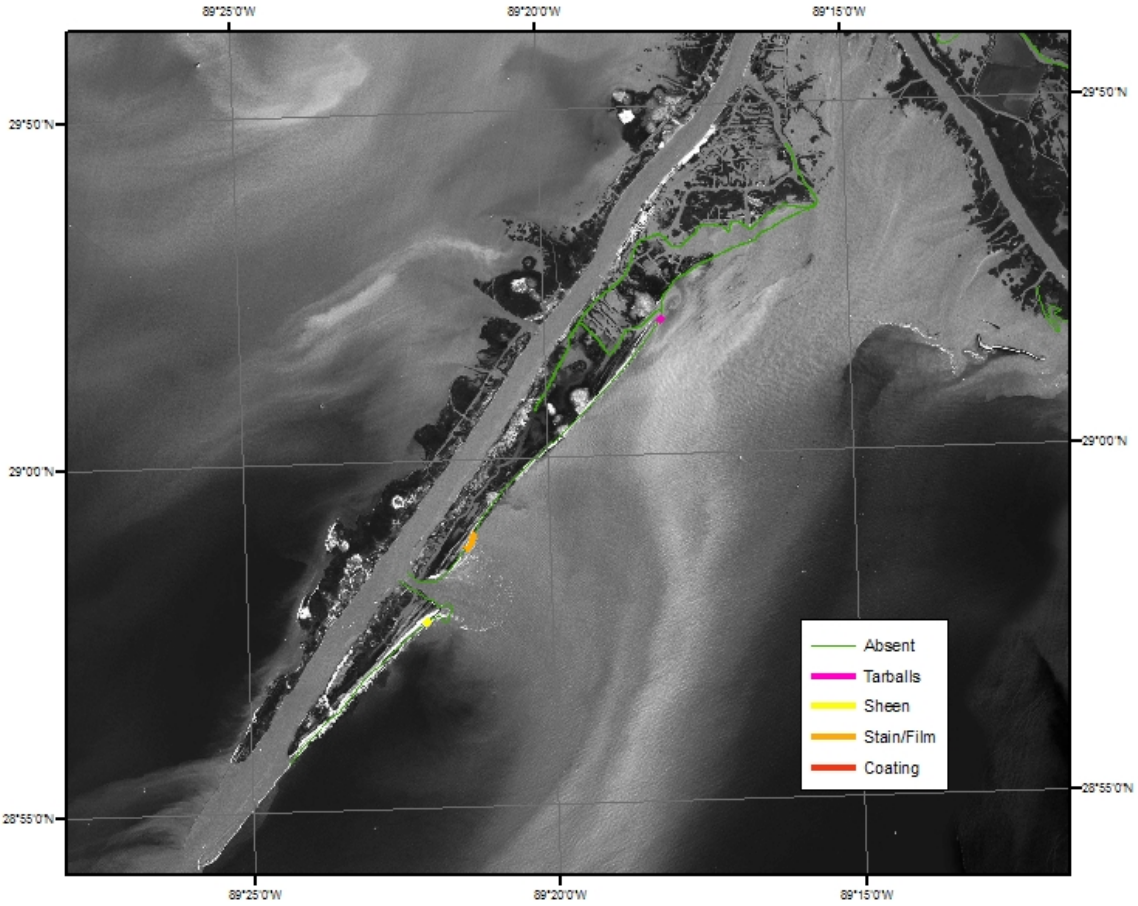


Figure 23. Preassessment Phase SCAT coverage and results detail – Southwest Pass.

5.3 Sand Beaches

Habitat and oil description. This habitat type consists of fine grained-sand beaches. In the spill impact area, sand beaches and flats occurred mainly along the south side of Southwest Pass and the end of North Pass. Stranded oil and tarballs were observed amongst debris and wrack on these beaches. There was no reported subsurface penetration of oil. However, after cleanup, sheening was observed during the preassessment survey in trenches dug in some areas.

Cleanup strategy and results. Manual recovery of tarballs, oiled sand, and oiled debris was conducted. Heavily oiled vegetation and debris were removed.

Cleanup endpoints. Remove all black/brown oil.

5.4 Freshwater/Intermediate Marsh

Habitat and oil descriptions. Freshwater and intermediate (i.e. partially saline) marsh and other herbaceous vegetation is the primary shoreline type along the passes and bays of the outer Mississippi Delta. Oiling occurred usually as a narrow band along the outer fringe.

Cleanup strategy and results. Cleanup methods included low-pressure flushing, wiping of oil from the vegetation, and passive recovery by sorbents. Some oiled vegetation was cut.

Cleanup endpoint. No more black/brown oil released (no visible free oil).

6.0 SUMMARY OF SHORELINE HABITAT OILING

6.1 Summary of Response Phase Oiling Lengths

Table 6 summarizes shoreline oiling for Response Phase fieldwork undertaken on September 30 and October 4. These lengths were derived from GPS-collected tracklines and data describing shoreline oiling conditions. Because these recorded the path of the boat or airboat used to survey the shorelines, and do not represent the shorelines themselves, these lengths are not exact and likely underestimate the true length of oiled shoreline. Similarly, these lengths only include oiled shoreline in areas surveyed. Shorelines outside the areas surveyed in collecting these data were also oiled at the time of the fieldwork. Oiled habitat area was not calculated for these data as information on marsh penetration/ oiled band width was not available.

Table 6. Total shoreline oiling length in meters. All values rounded to nearest integer.

Shoreline Habitat	Oiled Length (m)
Total	7,800

6.2 Summary of Preassessment NRDA Oiling Lengths

Table 7 summarizes the calculations on the extent of shoreline oiling by habitat type and degree of oiling. These lengths were derived from GPS-collected tracklines and data describing shoreline oiling conditions. Areas were derived form these lengths and recorded marsh penetration / oiled band width data for all oiled areas. Because these recorded the path of the boat or airboat used to survey the shorelines, and do not represent the shorelines themselves, these lengths are not exact and likely underestimate the true length of oiled shoreline.

Table 7. Total shoreline oiling length and habitat area in meters by habitat type and degree of oil exposure. All values rounded to nearest integer.

	Oiled Shoreline Length (m)				
Shoreline Habitat	**All**	**Sheen**	**Coating**	**Stain/Film**	**Tarballs**
Fresh/intermediate marsh	2,834	200	1,240	1,394	-
Sand beach	905	177	-	528	200
Total	3,739	377	1,240	1,922	200
	Oiled Habitat Area (m^2)				
	All	**Sheen**	**Coating**	**Stain/Film**	**Tarballs**
Fresh/intermediate marsh	11,657	841	8,680	2,136	-
Sand beach	2,081	406	-	1,214	461
Total	13,738	1,247	8,680	3,350	461

In all, 7,800 linear meters (25,590 feet) of shoreline were documented as oiled during the Response Phase fieldwork on September 30 and October 4. During the Preassessment Phase fieldwork on October 20-21, 2,834 linear meters (9,298 feet) of marsh shoreline and 905 linear meters (2,969 feet) of beach shoreline were documented as oiled. This same fieldwork documented 11,657 square meters (2.88 acres) of marsh habitat and 2,081 square meters (0.51 acres) of beach habitat as oiled.

These data indicate that significantly more shoreline habitat was oiled prior to the passage of Tropical Storm Matthew. The actual effect of the storm is difficult to determine due to the lack of comprehensive survey data from during the response. In general, anecdotal reports indicate that the storm's passage removed significant amounts of oil from the shorelines of the study area. Figure 24 contains photos from approximately the same location along some of the most heavily oiled marsh shoreline adjacent to the Shell facility discharge, from both before and after the passage of Tropical Storm Matthew. Although chlorosis was observed at a few sites, it was generally difficult to determine if other vegetation in the area was stressed by the hurricane because they were approaching the end of their growing season. New growth was commonly observed at the nodes of the *Phragmites* that otherwise had the appearance of being dead or severely stressed. This was true for oiled *Phragmites* plants as well as those with no apparent oiling.

Figure 24. Heavily-oiled marsh shoreline adjacent to Shell facility before and after the passage of Tropical Storm Matthew.

7.0 WILDLIFE IMPACTS

7.1 Summary of Impacts

Impacts to birds and small mammal populations were tracked as part of the response. In particular, dead or oiled brown pelicans, sanderlings, cormorants, and raccoons were directly observed. In general, many of the operational decisions during the response phase, particularly regarding the application of dispersant, were driven by threats to birds. As of October 4, unconfirmed reports indicated 29 birds were captured by wildlife recovery teams. Of these, 12 died prior to arrival at the rehabilitation center or during rehabilitation. Anecdotal reports from overflights indicate that two sea turtles were swimming through surface oil.

7.2 Wildlife Data and Initial Counts

Table 8 lists the unconfirmed number, species and outcome of wildlife collected by the rehabilitation center at several dates during the incident. Recovered individuals were both oiled and unoiled. An unknown proportion of oiled and unoiled individuals had injuries or showed signs of storm-related stress, thus mortality cannot be directly correlated to oiling in all cases. Note that species-specific data is not available for all dates and, to date, the raw data has not been confirmed by the USFWS.

Table 8. Unconfirmed wildlife numbers, species and outcomes collected by rehabilitation center during course of the response.

Date	Species	Captured	Died
September 28	Total	13	5
	Brown Pelican	6	2
	Cormorant		1
	Sanderling		2
	Raccoon	2	0
October 1	Total	19	11
October 4	Total	31	12

On January 4, 2005, USFWS provided additional information regarding bird injury. Based on the best available information in the USFWS Lafayette, LA field office, 24 birds were recovered during response operations. Of those 24, 10 oiled birds died and 10 lightly oiled birds were washed and released. The remaining four birds presumably had storm-related injuries and were unoiled. In addition, two raccoons were lightly oiled and released following rehabilitation. Further reconciliation of field data by USFWS personnel will be required before these data may be compared with those presented in Table 8.

Anecdotal information provided by the USFWS suggests that on October 6, 2004, 350 birds on a sandbar immediately south of South Pass were oiled in one incident. Only one or two birds were recovered from that incident, but field observations indicate that all birds observed on the sandbar sustained some oil exposure. Oiled birds that died were kept by the USFWS for later analysis, if necessary. Field personnel noted both hypothermia and direct toxicity effects of oil on birds. Finally, the USFWS has not yet examined potential injury for all potential USFWS trust resources under their jurisdiction. Overall, the USFWS estimates that 25-500 birds were injured from Ivan-related spills.

7.3 Wildlife Response and Hazing Activities

Collection and rehabilitation of oiled and dead birds and small mammals by wildlife recovery teams was ongoing during the response phase. Bird hazing activities were conducted from September 25 through October 4 and consisted of both airboat operations and the deployment of scare cannons.

8.0 TRUSTEE AND COOPERATING RP ACTIVITIES

8.1 List of Trustees

The natural resource Trustees participating in the response and Preassessment NRDA survey of this group of incidents are listed in Table 9.

Table 9. Natural resource trustees participating in the response and Preassessment NRDA survey activities.

National Oceanic and Atmospheric Administration
U.S. Fish and Wildlife Service
Louisiana Oil Spill Coordinator's Office, Office of the Governor
Louisiana Department of Wildlife and Fisheries
Louisiana Department of Natural Resources
Louisiana Department of Environmental Quality

The Minerals Management Service (MMS) also has cooperated with the Trustees to estimate volume from several discharges related to the MP-69/Hurricane Ivan incident. On February 10th, the Trustees were notified that Margaret Metcalf would be the point of contact for the MMS on this incident.

8.1.1 List of Trustee Contractors

The NOAA Damage Assessment Center asked Research Planning, Inc. (RPI) to prepare this assessment report and provide technical support during the Preassessment NRDA survey. RPI personnel participated in cooperative preassessment NRDA surveys during October 19-21. The primary contact at RPI is Jacqueline Michel.

RPI
(504) 280-4085
jmichel@researchplanning.com

8.2 List of PRP NRDA Personnel and their Contractors

As multiple spills occurred, the contact information below is organized by RP.

Name	Affiliation	Phone Number(s)	Email
Mike Condon	BP – NRDA	(206) 510-9199	michael.condon@bp.com
Juli Anna McNutt	BP / Entrix – Response Work	(713) 662-1931	jmcnutt@entrix.com
Bela James	Shell	(281) 544-6154	bela.james@shell.com
Michael Macrander	Shell – NRDA	(713) 907-8136	a.macrander@shell.com
Mark Ezell	Shell / CKA – NRDA	(225)-755-1000 cell (225) 281-0653	mark.ezell@c-ka.com
Peter Samuels	Chevron-Texaco	(281) 687-2450 cell	pesa@chevrontexaco.com

Name	Affiliation	Phone Number(s)	Email
	– NRDA	(713) 432-6469	

Shell NRDA contacts also used to represent BP.

8.3 Dates and Nature of Participation for Trustees and their Contractors

Trustee agencies participated in the Response and Preassessment Phase activities described below from spill notification on September 17 to the present. The activities included:

- NRDA coordination among Trustees;
- Participation in overflights and boat surveys to map the location of surface oil on water;
- Performing aerial and boat surveys to count the number of wildlife present and oiled in the spill impacted areas
- Supervision of the oiled wildlife rehabilitation efforts;
- Participation in wildlife hazing activities;
- Participation in shoreline assessment surveys;
- Responding to resource issues at the Command Center in Fort Jackson;
- Coordination with RP representatives to initiate a cooperative assessment process

Note that Shell and BP took lead roles during the MP-69 / Hurricane Ivan Spills in organizing overflights, response planning, and coordinating logistics for the cooperative preassessment fieldwork. Much of the field survey work prior to the cooperative preassessment and field data collection support during the preassessment was conducted by C-K Associates, a Shell contractor. The Louisiana Oil Spill Coordinator's Office is the Lead Administrative Trustee (LAT).

8.4 List of Participants in Cooperative Preassessment NRDA Surveys

Name	Affiliation	Phone Number(s)	Email
Zach Nixon	RPI	919-218-7287	znixon@researchplanning.com
Heidi Hinkeldey	RPI	803-463-6992	hhinkeldey@researchplanning.com
Jim Jeansonne	NOAA	813-340-5690	Jim.jeansonne@noaa.gov
Bela James	Shell	713-833-6886	Bela.james@shell.com
Rene Bernier	ChevronTexaco	713-432-6632	--
Peter Samuels	ChevronTexaco	713-432-6469	pesa@chevrontexaco.com
Terry Romaire	LDWF	225-765-2394	tromaire@wlf.louisiana.gov
John de Mond	LDEQ	225-219-3768	john.demond@la.gov
Dick Stanek	LDNR	225-342-7946	richards@dnr.state.la.us
Todd Baker	LDWF	337-962-2992	tbaker@wlf.louisiana.gov
Kate Clark	NOAA	401-782-3260	kate.clark@noaa.gov
Michael Macrander	Shell	713-907-8136	a.macrander@shell.com
Ben Summerlin	C-K Associates	225-755-1000	--
Mark Ezell	C-K Associates	225-755-1000	--

Name	Affiliation	Phone Number(s)	Email
Daniel Bollich	C-K Associates	225-755-1000	--
Lee Walters	C-K Associates	225-755-1000	--

9.0 SUMMARY OF FIELD DATA COLLECTION EFFORTS

9.1 Bird Surveys

As mentioned above, USFWS personnel are in possession of all bird and wildlife survey and rehabilitation data. The USFWS has not yet examined potential injury for all potential USFWS trust resources under their jurisdiction. Overall, the USFWS estimates that 25-500 birds were injured from Ivan-related spills.

9.2 Sampling

9.2.1 Source Samples

ENTRIX secured a neat sample during the initial response for the BP MP-80 Delta 20" Pipeline Spill incident and shared it with William Whitmore at NOAA (Assistant SSC). The existence and storage location for other Ivan-related source samples is unknown, but Louisiana DEQ presumably has these in storage.

9.2.2 Water Column Sampling

For the BP MP-80 Delta 20" Pipeline Spill, water column samples were collected by ENTRIX on successive days (with splits being shared with Louisiana Department of Environmental Quality personnel) and sent to Pace Laboratories for PAH analysis. The existence and storage location for other Ivan-related water column samples is unknown, but Louisiana DEQ presumably has split samples in storage, if collected.

Attachment A: NRDA PREASSESSMENT FIELD SHEET

Preassessment Team: _____ **Date:** _____ **Time:** _____

Members: _____

Zone number: _____ **Lat/Long:** _____

Photo: Number:_____ **Direction:** _____
Number:_____ **Direction:** _____
Number:_____ **Direction:** _____

Habitat Type:_____
(i.e. Phragmites marsh, Spartina marsh, mud flat, sand flat/beach, etc.)

Vegetation Height:_____ **Water Depth:**_____

New Growth? No Yes **Oiled?** No Yes

Chlorosis on new growth: Severe Moderate Slight None

Oil Thickness on Habitat: Heavy Moderate Light Stain/Film

Band width (ft): _____ **Starting at**: _____ **Penetration** (ft):_____

Oiling Category: Heavy Medium Light Stain/Sheen

Sample? No Yes **Sample ID/Type**: _____

Oil/Sheen in sediments: No Yes **Hydrocarbon Odor:** No Yes

Fauna present: No Yes **Wrack present:** No Yes

Requires clean-up? No Yes (if yes, notify operations)

Air Temp: _____ **Sky:**_____ **Salinity:**_____

Winds: _____ **Tides:** _____

Notes: _____
_____
_____
_____
_____

Sketches: