**(FINAL) MISSISSIPPI CANYON 252 (DEEPWATER HORIZON) TEXAS BASELINE SURVEY AND SAMPLING WORK PLAN - AUGUST 2, 2010**

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Approval of this work plan is for the purposes of obtaining data for the Natural Resource Damage Assessment. Parties each reserve its right to produce its own independent interpretation and analysis of any data collected pursuant to this work plan.

**APPROVED**:

Joyce Mjeley — 8/4/2010

BP Representative: — Date

NOAA Trustee Representative: — Date: 8/4/10

Texas Parks & Wildlife Dept. on behalf of the Texas Trustee Council: — Date: 8/3/2010

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Executive Director

August 2, 2010

Gary Harmon
ENTRIX
[redacted]

**RE:** Deepwater Horizon Oil Spill Natural Resource Damage Assessment

**Subject:** Texas Baseline Sampling and Survey Work Plan

Dear Gary;

On behalf of the Texas Trustees, we would like to thank Entrix and BP for their input and participation in the development and execution of the Texas Baseline Sampling and Survey Work Plan. As you are aware, Texas in cooperation with BP and Entrix has been busy completing the first round of the baseline sampling and survey. The Texas Trustees anticipate two additional survey only events in August and September of 2010 and will continue to coordinate these efforts with BP and Entrix.

Concurrent with the execution of the work plan, the Texas Trustees have received and accepted BP and Entrix's last requested changes to the work plan (Attached). Given the fact that the Texas Trustees accepted BP's and Entrix's changes to the Work Plan and that Entrix was present during and participated in the baseline sampling as BP's representative, the Texas Trustees are confident that there is no legitimate basis for any objection to or challenge of the process and methodologies in this Baseline Survey and Sampling Work Plan.

Consequently, the Texas Trustees are moving the Work Plan forward as final. The Texas Trustees fully expect that BP, as an indication of its intent to continue to work cooperatively with the Texas Trustees, will sign the Work Plan and pay all reasonable costs associated with it. Should you have any questions please feel free to contact me [redacted]

Sincerely,

Don Pitts, Director
Environmental Assessment, Response & Restoration Program

Cc: Richard Seiler (TCEQ), Tommy Mobley (GLO), Craig Giggleman (FWS), Laurie Laurie Sullivan (NOAA), Heather Best (NPS)

[redacted]

## (FINAL) MISSISSIPPI CANYON 252 (DEEPWATER HORIZON) TEXAS BASELINE SURVEY AND SAMPLING WORK PLAN - AUGUST 2, 2010

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## (FINAL) MISSISSIPPI CANYON 252 (DEEPWATER HORIZON) TEXAS BASELINE SAMPLING AND SURVEY WORK PLAN - AUGUST 2, 2010

### Introduction

On April 20, 2010 a fire and explosion occurred on board the Deepwater Horizon semisubmersible drilling platform, with more than 120 crew aboard. The Deepwater Horizon was located some 50 miles southeast of the Mississippi Delta in the Gulf of Mexico (GOM). The fire and collapse of the platform resulted in an ongoing release of crude oil into the GOM. Under the 1990 Oil Pollution Act (OPA), a Natural Resource Damage Assessment (NRDA) is a legal process to determine the type and amount of restoration needed to compensate the public for harm to natural resources and their human uses that occur as a result of an oil spill. Natural Resource Trustees are Indian Tribes, Federal and, State agencies designated by the president and governors to act on behalf of the public to conduct an NRDA and seek compensation for natural resources under their respective trusteeship.

In response to the ongoing release of crude oil into the GOM from the Deepwater Horizon well site and to insure the protection of Texas natural resources, the Texas Natural Resource Trustees have undertaken the development of this baseline sampling and survey work plan to establish the current environmental conditions along the Texas coastline. The Texas Natural Resource Trustees working in coordination with the GOM Deepwater Horizon NRDA will use this plan in support of any NRDA conducted in Texas. The participating Trustee agencies are the Texas General Land Office (GLO), the Texas Commission on Environmental Quality (TCEQ), the Texas Parks and Wildlife Department (TPWD), National Oceanic Atmospheric Administration (NOAA) and the Department of the Interior (DOI) as represented by the United States Fish and Wildlife Service (USFWS) (collectively the Texas Trustee Council). The listed agencies have been designated Trustees pursuant to authority granted by the Oil Pollution Act (OPA), 33 U. S. C. §2701, et seq. These agencies are authorized by OPA, the Clean Water Act (CWA), 33 U. S. C. §1251, et seq.; the Texas Oil Spill Prevention and Response Act (OSPRA), Tex. Nat. Res. Code §40.00, et seq., by the implementing regulations under those statutes, and any other applicable laws or authorities, to assess damages when there is injury to, destruction of, or a threat to natural resources as a result of an unauthorized discharge of oil.

As permitted under OPA's NRDA regulations, in some instances BP has been working cooperatively with the Gulf Coast State and Federal Trustees (Trustees) to collect baseline data and to conduct NRDA activities. The Trustees have afforded BP the opportunity to provide input to Mississippi Canyon 252 (Deepwater Horizon) Texas Baseline Sampling and Survey Work Plan with the intention of having the plan signed by the representatives of the Trustees and BP. Cooperation facilitates the collection and sharing of reliable data, while allowing all parties to conduct their own analysis and interpretation of that data.

## Federal Natural Resource Trustee Agencies:

NOAA Damage Assessment, Remediation, and Restoration Program (DARRP): http://www.darrp.noaa.gov/

DOI Natural Resource Damage Assessment and Restoration Program: http://restoration.doi.gov/

FWS Restoration Program: http://www.fws.gov/contaminants/issues/restoration.cfm

## State of Texas Natural Resource Trustee Agency:

TPWD Environmental Assessment, Response & Restoration Program: http://www.tpwd.state.tx.us/

TCEQ Natural Resource Trustee Program: http://www.tceq.state.tx.us/remediation/nrtp/nrtp.html

GLO Natural Resource Damage Assessment Program: http://www.glo.state.tx.us/nrda/

## Overview

The purpose of this work plan is to document baseline environmental conditions at key locations in advance of shoreline oiling caused by the Mississippi Canyon 252 (Deepwater Horizon) release along the Texas coast. The Texas Trustee Council in coordination with the GOM Deepwater Horizon NRDA will implement this plan when the threat to the Texas coast is determined to be appropriate and relevant for the protection of Texas natural resources. In the event that a tropical storm or hurricane impacts the Texas coast, the Texas Trustee Council in coordination with the participants of the GOM Deepwater Horizon NRDA and BP will determine the need to conduct post storm evaluations of the appropriate sections of the Texas coast. Prior to implementing this plan, the Texas Trustee Council in coordination with the GOM Deepwater Horizon NRDA will select locations across the potentially affected area. Survey stations will be geographically located and designed to represent pertinent habitat types and current pre-impact conditions. Additional samples may also be collected at other specially selected locations, such as jetties, groins or shorelines covered in rip-rap in a manner as close as feasible to the following protocols. Should the threat to Texas coastal resources from the Deepwater Horizon oil spill continue beyond the summer of 2010, sampling and/or surveys may be repeated to represent the most relevant conditions prior to oil reaching Texas beaches. This document describes the four primary objectives necessary to document baseline environmental conditions at the selected survey stations. To the extent capability exists, field survey teams should strive to accomplish the four objectives listed below at each survey station to ensure data collection is performed consistently across all survey stations and with other sampling and survey efforts that may occur opportunistically.

## Objectives and Tasks

Objective 1: Document baseline PAH concentrations of water and sediment

Task 1A – Collect shallow subsurface water samples.

Task 1B – Collect sediment samples in the intertidal zone.

Task1C – Conduct systematic surveys of shoreline areas to determine occurrence tar ball and other forms of oil, document rates of deposition and collect samples of tar or other forms of oiling that predate arrival of new oil.

Task 1D - Conduct systematic surveys of shoreline areas to determine tar ball occurrence and rates of deposition.

Objective 2: Document baseline occurrences of relevant biota in intertidal or shallow subtidal habitats.

Task 2A – Collect samples of biota for future community analysis.

Objective 3: Document baseline deposition of dead and stranded wildlife (may also be conducted post-incident)

Task 3A – Conduct systematic surveys of shoreline areas to determine baseline rates of deposition of dead and stranded wildlife.

Objective 4: Record baseline conditions of sites using a detailed and systematic photographic technique and field documentation.

Task 4A – Collect high resolution panoramic photos and build a detailed photographic record using a paired close up/perspective method in key areas that may be oiled

Task 4B – Record observations of general baseline environmental conditions

## Modifications and Amendments

It is widely recognized that the highly dynamic conditions associated with environmental sampling and oil spill responses may require sampling methodologies and protocols to be modified. Any substantive modification or amendment to this work plan must be in writing and signed by all signatories of the original work plan. Such modification or amendment shall be an Attachment to this work plan and incorporated as part of the work plan for all purposes. Any references in this document to the "work plan" shall be deemed to include any such Attachments. It is further contemplated that field survey teams may need to make minor alterations or deviations from protocols based on survey station conditions or type and degree of oil present. These minor deviations from the sampling protocol and justifications may be made with the consensus of the field survey team and should be recorded on the Texas NRDA baseline field data forms, chains of custody records and in field notes.

## Methods

A. Survey Station Selection

Samples will be collected at a maximum of 21 survey stations along the Texas coast. Prior to sampling, the Texas Trustee Council will select locations across the potentially affected area. Survey stations will be geographically located and designed to represent current pre-impact conditions for front beach habitat types which are anticipated to receive oiling from the Deepwater Horizon. In the event that the Trustees become aware that other habitats may become potentially oiled, this plan may be modified to reflect the appropriate sampling strategies for that habitat type. Survey stations will be divided over the Texas cost such that approximately three survey stations will be located in the Sabine Lake area, six in the Galveston Bay area, three in the Matagorda Bay area, six in the Corpus Christi area and three in the Lower Laguna Madre area (Fig 1). Additional samples may also be collected at other specially selected locations (SSL), such as jetties, groins or shorelines covered in rip-rap near or adjacent to the 21 survey stations. It is anticipated that approximately 10 SSL may be sampled as part of this effort.

1. *Pre-oiling survey station selection criteria:*
   a. Habitats of greatest concern / sensitivity / critical to species of special concern
   b. Sites that are likely to be oiled soonest
   c. Sites with historical or known potential for contamination not related to the Deepwater Horizon spill
   d. Accessibility
   e. Public access / recreational areas
   f. Distances apart

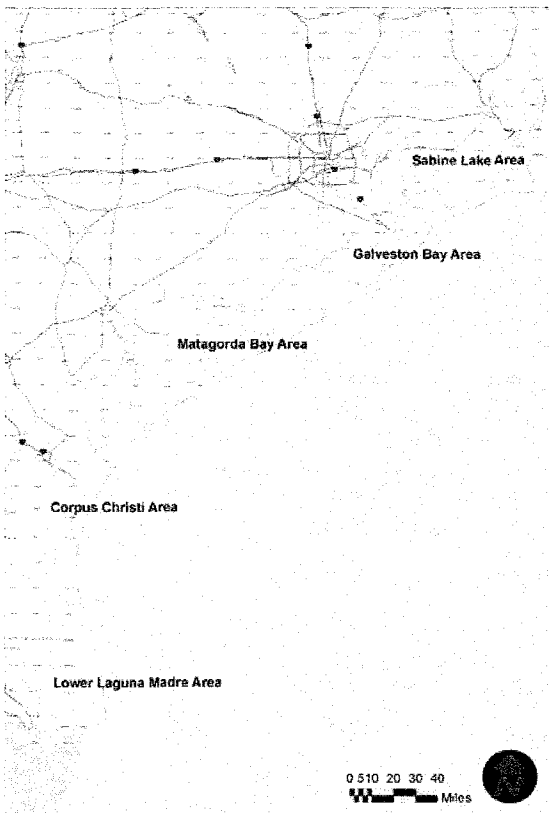



Fig.1 Texas baseline survey station divisions

B. Water and Sediment – Objective 1

1. *General Plan*

The general recommendation regarding beach sampling is to generate a standardized sampling grid consisting of a single transect perpendicular to the shoreline at each survey station. One composite sediment sample from each of the three (3) intertidal zones as described in 2d and two (2) 1-liter and 40ml VOA water samples will be collected along the sample transect. If possible, transects should be established in areas with fine sediments, avoiding gravel or cobble substrates. Additional sediment and water samples may also be collected at other SSL near or adjacent to pre-determined survey stations, such as jetties, groins or shorelines covered in rip-rap in a manner as close as feasible to the following protocols.

To help future re-sampling efforts, it is important that the position of each survey station and any additional samples be established accurately relative to permanent markers or landmarks as well as recording longitude and latitude using GPS.

This protocol may need to be modified based on variations in habitat type, or resource and time constraints. Deviations from the sampling protocol and justifications should be recorded on the field data forms, chain of custody (COC) and in field notes. Should the threat to Texas coastal resources continue beyond the summer of 2010, water and sediment sampling may be repeated to represent the most relevant conditions prior to impact.

2. *Establish Sample Transects*

a. Establish the upper end of the sample transect in the supra tidal zone at a point above the storm wash line or at least the active beach berm (e.g., in the area of weathered logs or on a seawall) above the normal higher high tide line (Fig. 2). Record the GPS coordinates (WGS84, decimal degrees) of the uppermost transect end (Survey Station Waypoint) using a hand-held GPS unit. If practical, this point should be marked with (a) a stake or (b) spray paint on a permanent surface (e.g. boulder or seawall) or (c) co-located with a permanent structure or object to facilitate re-establishing the transect at a later time.

**NOTE:** Markings on permanent structures should be done so as not to deface, destroy or obscure private or public property. Marking should be visible and durable but non-destructive.

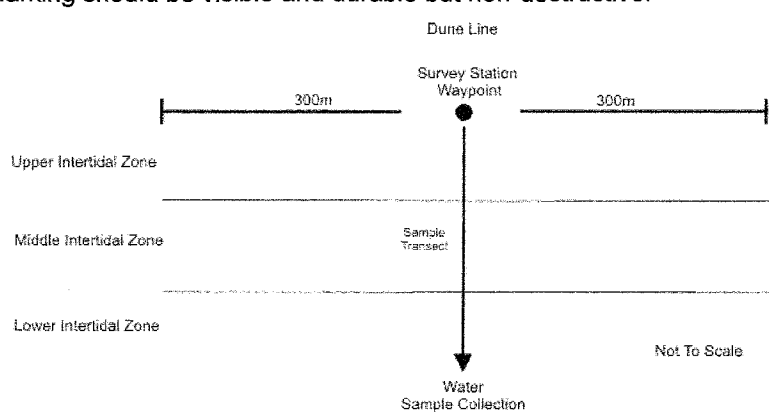



Fig. 2: Survey Station description

b. As a backup to the GPS coordinates (especially if permanent markers were not available or installed), measure the distance and compass bearing from each transect end to two or more permanent landmarks. Document all measurements, compass bearings and other relevant notes in the field data forms or field notebooks.

c. Take several photographs of the reference landmarks, as well as photographs up, down and across the beach. Photographs should adequately document current conditions and the types of habitat present. See Section E.

d. Composite sediment samples will be collected along the sample transect within the three different intertidal elevations. Samples will be collected from within the Upper, Middle, and Lower intertidal locations along the sample transect and should approximately correspond to Mean High Water (MHW), Mean Sea Level (MSL), and Mean Lower Low Water (MLLW) intertidal heights. The mid and low tide elevations may be estimated based on time of sampling relative to predicted tide levels for the area to be sampled.

e. In addition to water and sediment samples collected along the sample transect, additional water and sediment samples may also be collected at other SSL, such as jetties, groins or shorelines covered in rip-rap in a manner as close as feasible to the following protocols. Deviations from the sampling protocol and justifications should be recorded on the field data forms, COC and in field notes.

3. *Sediment Sampling*

a. Sediment Sample Method Detail

Sediment sampling should be done consistent with the latest version of the MS Canyon 252 (Deepwater Horizon) Oil Spill Sediment Sampling Protocol for NRDA. Select an area of the beach with fine sediments, and avoid gravel or cobble beaches, where practical. If coarse material (gravel/cobble) is encountered, remove the cobble/gravel layer and sample the underlying finer-grain sediment. A composite sediment sample should be collected along the sample transect from each of the upper, middle, and lower intertidal zones for a total of 3 composite sediment samples at each survey station. Each intertidal zone should be divided into three equal subparts perpendicular to the sample transect line. Composite samples should be collected so that approximately 1/3 of the sample container is filled from each subpart of the intertidal zone being sample. Collect sediment with a pre-cleaned stainless steel spoon wrapped in aluminum foil or a pre-cleaned disposable plastic scoop, removing only the top 2 cm of sediment. Samples collected in the lower intertidal zone may be collected with a Ponar, modified van Veen grab; Ekman grab; box dredge, shovels or coring devices. All samplers and pans should be pre-cleaned and decontaminated between samples by washing in ambient water and rinsed using a high flash solvent. Place sediment directly into a pre-cleaned 500ml glass jar unless using a dredge or coring device. Samples collected with a dredge or coring device should be placed in a pre-cleaned stainless steel or foil lined pan and sediment scooped from the top 2 cm using a pre-cleaned stainless steel spoon wrapped in aluminum foil or a pre-cleaned disposable plastic scoop,, and placed into a pre-cleaned 500ml glass jar. Collect enough sediment to fill each container. Avoid rocks and debris that are not representative of the typical

sediment type being sampled. All samples need be kept on ice and logged into a COC and sample tracking forms.

b. Preservation/Holding Time
   1. Immediately place all sediment samples in a cooler and keep at 4°C (on wet ice). Freeze samples for chemical analysis by the end of each day if samples will not arrive at the laboratory within 7 days.
   2. Ship samples on the day of or the day following collection if possible. Samples should be shipped following the shipping instructions in the NRDA Sample Shipping Instructions MS Canyon 252 (Deepwater Horizon) Oil Spill guidance document.
   3. Sediment samples can be held frozen in the dark for several years without loss of sample integrity. Sediment extracts can be held at 4°C in the dark for 40 days without loss of sample integrity.

c. Analytical Methods

   Polycyclic Aromatic Hydrocarbons (PAH)

   Since most of the toxicity in oil is due to the PAHs, it is often the preferred analysis for NRDA. The analytes must include the alkyl-substituted PAH homologs, in addition to the standard PAH "priority pollutants". This method is referred to as Modified EPA Method 8270, because the list of PAHs is expanded to include the alkylated homologs, using GC/MS in the selected ion monitoring mode. Detection levels should be 1 ppb for individual PAHs to support injury assessment using toxicity thresholds.

   ***Note***: The laboratory must be instructed to present chemical results from sediment samples on a dry-weight basis.

4. *Intertidal Water Samples*

   a. Intertidal Water Sample Method Detail

   Two 1-liter jars should be filled at the seaward end the sample transect established during sediment sampling. Wade into the water along each of the established transects used for the sediment sampling to approximately the 2-foot depth, provided that it is safe to do so. Avoid disturbing bottom material during sample collection. To eliminate the potential for loss of volatile hydrocarbons, collect a sub-surface sample by lowering the jar beneath the surface, removing the lid allowing the jar to fill completely, voiding all air. Replace the lid while the jar is still under water. Attempt to keep the jar and the lid at least one-foot beneath the surface while collecting the sample to prevent any potential surface oil or other contaminates from entering the cap or jar. All samples need to be kept on ice and logged onto a COC form. Deviations from the sampling protocol and justifications should be recorded on the field data and COC forms, and in field notes.

   In addition to the two 1-liter jars, two 40ml VOA vials should be filled at the seaward end the sample transect established during sediment sampling. Wade into the water

along each of the established transects used for the sediment sampling to approximately the 2-foot depth, provided that it is safe to do so. Avoid disturbing bottom material during sample collection. To eliminate the potential for loss of volatile hydrocarbons, collect a sub-surface sample by lowering the VOA vial beneath the surface, removing the lid allowing the VOA vial to fill completely, voiding all air. Replace the lid while the VOA vial is still under water. Attempt to keep the VOA vial and the cap at least one-foot beneath the surface while collecting the sample to prevent any potential surface oil or other contaminates from entering the cap, or VOA vials. All samples need to be kept on ice and logged onto a COC form. Deviations from the sampling protocol and justifications should be recorded on the field data and COC forms, and in field notes.

b. Preservation/Holding Time
   1. No preservative should be added.
   2. Immediately place all water samples in a cooler and keep on ice (**do not freeze**). Keep samples at 4°C, and ship to the lab daily (if feasible) to maximize available time for processing.
   3. Ship samples on the day of or the day following collection if possible. Samples should be shipped following the shipping instructions in the NRDA Sample Shipping Instructions MS Canyon 252 (Deepwater Horizon) Oil Spill guidance document.
   4. 1-liter samples for PAHs should be extracted by the lab within 7 days of collection and analysis completed no later than 14 days after collection.
   5. VOA samples should be analyzed by the lab within 14 days of collection (and are only valid if pre-cleaned).

c. Analytical Methods

   Polycyclic Aromatic Hydrocarbons (PAH)

   Since most of the toxicity in weathered oil is due to the PAHs, it is often the preferred analysis for NRDA. The analytes must include the alkyl-substituted PAH homologs, in addition to the standard PAH "priority pollutants". This method is referred to as Modified EPA Method 8270, because the list of PAHs is expanded to include the identification of alkylated homologs, using GC/MS in the selected ion monitoring mode. Detection levels should be 1 ppb for individual PAHs to support injury assessment using toxicity thresholds.

   Volatile Organic Analyses (VOA)

   The most toxic fractions of oil, volatile organic carbons are more miscible in water than other petroleum fractions, but also biodegrade and volatilize quickly. Recommended analyses include EPA Method 601 or 624 with detection limits set < 1ppb for all target compounds in this standard method.

5. *Oil, Tar and Tar Ball Survey Techniques*

a. General Oil, Tar and Tar Ball Methodology

Additional water and sediment samples may be collected outside of survey stations in areas with high volumes or high frequencies of weathered oil, SSL. These SSL's may indicate potential sources of oil or tar during a spill event and should be documented for future use by response and NRDA teams. Staff should be prepared to collect oil/tar samples and/or record the locations of the oil/tar SSL with GPS during all surveys or events undertaken to meet the listed objectives (ie. systematic searches for dead biota or site characterization efforts could include a report of the incidence and locations of historical oil/tar). Samples should be collected using a disposable or wrapped sampling scoop as described in Section B 3, and placed into pre-cleaned 125ml or appropriately sized amber glass jars. Record GPS coordinates (WGS84, decimal degrees) as a waypoint and in data forms and notes. Take several photographs up, down and across the beach where the sample is collected. Photographs should adequately document current conditions and the types of habitat present. All samples need to be kept on ice and logged into a chain-of-custody and sample tracking forms. Samples preservation, holding times and analyses should be completed as defined in Section B3 for all sediment samples. Deviations from the sampling protocol and justifications should be recorded on the field data forms, COC and in field notes.

b. Tar Ball Survey Detail

To systematically document the occurrence and to estimate the rate of deposition and volume of oil present prior to any Deepwater Horizon oil reaching beaches, field survey teams will conduct field surveys and establish survey plots at the 21 survey stations. Pre-impact oil surveys (Tar Ball Survey) will be conducted once a month for three consecutive months. Should the threat to Texas coastal resources continue beyond the summer of 2010, Tar Ball Surveys may be repeated to represent the most relevant conditions. Deviations from the sampling protocol and justifications should be recorded on the field data forms, COC and in field notes.

1. Survey Plot Location

At each survey station and where feasible teams will establish a 600m long survey plot that covers 300m up the shoreline and 300m down the shoreline from the Survey Station Waypoint (Fig. 2). The starting and ending GPS coordinates (WGS84, decimal degrees) for the entire 600m survey plot should be recorded on the Texas NRDA baseline field data form.

2. Qualitative Survey

Field survey teams should walk or view the entire survey plot to get a sense of the different degrees of oil that are or may be present. While field survey teams are conducting the Tar Ball Survey, they should also be noting any dead or stranded wildlife or other site conditions as provided in Sections D and E of this document. Teams should use SCAT terminology when describing oil conditions on their field data forms and notes (Appendix A). Be systematic in how the parameters are recorded in your field notebook and Texas NRDA baseline field data form.

a) To describe each different shoreline type or areas with significant differences in oiling, field survey teams should use a unique Zone ID. For consistency, use A for the first one described, then B, C, etc. Each different Zone ID should describe a different habitat type or oil distribution. When distinct bands of oil are present at different tidal zones but within the same shoreline type, field survey teams should use the same Zone ID for the shoreline but use additional lines on the Texas NRDA baseline field data form to distinguish between tidal zones.

b) The location of the oil should be recorded relative to lower, middle, upper, or supra (above high) tidal zones. Field survey teams should include estimates of the average distance of the oil zone perpendicular to the beach (width). As well as, the distance of the oil zone parallel to (alongshore) the beach (length).

c) Describe the degree of the oiled sediment, using SCAT terms or general categories of light, moderate, heavy. Using the method describe in Section E, the average percent cover of the oil in the zone (to the nearest 5%) should be recorded.

d) Report the oil / tar ball thickness (stain, coat, cover, etc.) and condition (fresh oil, mousse, tar balls, patties, etc.) using SCAT terminology.

e) Where surface oil has penetrated into the sediment, record the depth of oiled penetration, from the sediment surface to the bottom of the oil (e.g. 0-5 cm).

f) Take several photographs up, down and across the beach. Photographs should adequately document current conditions and the types of habitat present. Record any photographs taken of the oil in this zone on the field forms and notes. Use a photo scale to take representative photographs of each category, type and degree of oiling for calibration with other surveys and later illustration.

g) Make a sketch on the provided map data form of the entire segment surveyed, showing the locations of all oil zones you described and all photographs taken.

h) Make sure field forms and your notes are complete, and include the survey station ID, GPS coordinates (WGS84, decimal degrees), date and time of survey, and team members name/affiliation.

C. Tissue / Biota Sampling – Objective 2

This work plan provides guidance for sampling tissue and biota for the Texas Baseline Survey. Survey methods may be supplemented or modified to be in accordance with the current version of the DRAFT MISSISSIPPI CANYON 252 (DEEPWATER HORIZON) SAND SHORE SAMPLING GUIDANCE DOCUMENT. Modifications or deviations from the sampling protocol and justifications should be recorded on the field data forms, COC and in field notes. Benthic samples may be collected from the intertidal habitat or shallow subtidal habitat associated with a sample transect or where additional samples are collected at other specially selected locations, such as jetties, groins or shorelines covered in rip-rap.

a. Benthic Sample Method

Sampling for benthic organisms will be conducted at all 21 survey stations after chemistry sampling is completed. Visual observations and photographs will be recorded along the length of the sample transect to document oiling conditions and the presence of mammal, avian, and macroinvertebrate species, including signs of feeding activity and animal behavior. At each survey station one composite benthic sample will be collected along the sediment sample transect. The transect will be generally divided into three areas of sediments representative of high water (upper tidal), mean water (middle tidal) and low water (lower tidal) levels. Benthic samples will be collected randomly across each of the intertidal zones along the sample transect for each survey station. Sediment dredge grabs will be collected using a Ponar, modified van Veen grab; Ekman grab; box dredge. Shovels and coring devices may used in the intertidal zones. All samplers should be pre-cleaned and decontaminated between samples by washing in ambient water and rinsed with a high flash solvent. Benthic samples will be composed of three grabs (replicates), one collected from each of the three intertidal areas as described above. The contents of each grab will be emptied into a 1mm mesh sieve to separate the benthos from the sediment with ambient water. The residual contents of the sieve will be preserved in a 1-liter bottle with 10 percent formalin (one part full-strength formalin to nine parts seawater). Borax may be added to buffer the solution. In the laboratory, the biota will be identified to species and enumerated. In addition to the analytical and benthic samples, an individual sediment sample of approximately 100g will be collected from each intertidal zone along the sample transect and placed in a Ziploc or Whirl-Pak bag for grain size analysis. Samples should be refrigerated, but not frozen and logged into a COC and sample tracking forms.

D. Background Levels for Dead and Stranded Wildlife – Objective 3

Field survey teams should conduct systematic searches to document the background levels for dead and stranded wildlife within the survey stations. Points of interest for these surveys include birds, mammals, turtles, aggregations of invertebrates, etc.

Search methods must should include a measured distance of one kilometer on each side of the designated sampling point.

All avian, mammalian, and sea turtle carcasses encountered by survey teams should be identified, recorded on the data sheet, and photographed. All avian carcasses, with the exception of pelagic birds, and/or listed avian species, shall be marked with fluorescent orange paint (or some other bright color), removed and buried behind the dune line. Pelagic birds and/or listed avian species and all oiled birds shall be retained for potential chemical analyses or necropsies and handled as outlined in the "Carcass Collection Protocols". Any recovered oiled wildlife that is determined to be associated with the Deepwater Horizon Oil spill will be coordinated with the response effort by contacting the Mississippi Canyon 252 (Deepwater Horizon) wildlife hotline at 866-557-1401. For marine mammal carcasses, GPS locations will be recorded and the Marine Mammal Stranding Network (Cell: [redacted]; Hotline: 800-9MAMMAL) will be contacted for appropriate disposal. For sea turtles carcasses GPS locations will be recorded and the Sea Turtle Stranding Network (Lower Coast 361- 949-8173 ext. 226; Upper Coast 409-766-3500; ext 3670; cell [redacted]) will be contacted for appropriate disposal.

All fish and crab carcasses or remains encountered by field crews will be identified to species, if possible, counted, documented, and removed from the shoreline. It is recommended that survey crews carry trash bags for this purpose. Photographs should be taken if species cannot be identified. Large aggregations of dead mollusks should be noted on the data sheet with an approximate count and species composition.

In the event sea turtle nests are identified during surveys, they will be marked and their location reported as per the current Deepwater Horizon/Mississippi Canyon 252 Pre-Assessment and Data Collection Plan Marine Mammal and Turtle Workgroup.

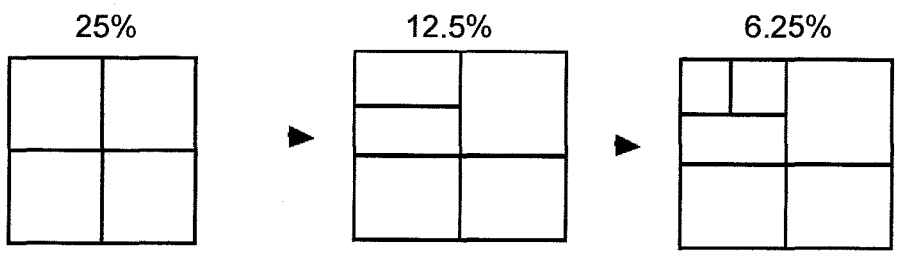
E. Basic Site Characterization and Documentation – Objective 4

Field survey teams will collect basic data that describes each survey station. These data may also be collected at other specially selected locations, such as jetties, groins or shorelines covered in rip-rap. These data will provide the context for the samples and surveys described above. Teams should conduct pre-deployment calibration of terminology, technique and methodologies to ensure the highest quality of data is collected. Teams should calibrate pace for time and distance and record this information on the team log. Field data shall be recorded on the Texas NRDA baseline field data forms. Teams should clearly photo-document survey stations so that current conditions, habitat and any existing oil are adequately documented. Field survey teams should review and may use the protocols outlined in the MS Canyon 252 (Deepwater Horizon) Oil Spill NRDA Field Photography Guidance. MS Canyon 252 (Deepwater Horizon) Oil Spill NRDA Photo Logger Forms should be completed for each Survey Station. Teams shall use photographic geo-referencing software (i.e. GPS-Photo Link) or GPS enabled photographic equipment to document current conditions. The GPS track log should be enabled during all field survey efforts. Teams should also ensure that the camera and GPS time is set to the current time for the location to be photographed (i.e. central time, day light savings etc.) at the beginning of each day or after battery changes.

a. Calibration Exercise

1. Conduct group calibration exercises at the start of each team deployment or personnel change; include all survey teams in the training exercise.
2. Review field data forms, terminology and decide what units are to be used (e.g., English or metric, and feet versus yards). Establish team member assignments and safety protocols.
3. Calibrate estimated oil distribution (% cover)

   Using an approximately $1m^2$ box (quadrate) with simulated oiling and have everyone estimate the percent of oil cover. Mentally herd the oil into one corner, or if possible, move the oil into one corner of the box. Draw a line to divide the original box in half. Keep halving the area until all of the oil fits into one corner. Estimate the area of the oil and compare with the original estimates. Repeat this process for different amounts of oil, until everyone is making similar estimates. See diagram below.




4. Calibrate distance estimates:
   - Measure out 25 m with a tape and have everyone determine the number of strides while walking at their pace.
   - Select various distances for visual estimation, then actually measure distances with a tape or laser range finder.
5. Team members should record their pace and distance estimates in field notes.

**Resources and Logistics**

It is anticipated that three (3) field survey teams will be formed to evaluate the Texas coast prior to any impacts from the Deepwater Horizon spill. Each sampling event is expected to be completed within a one week time period. Ideally, these teams should consist of representatives from the three State (TPWD, TCEQ, GLO) and two Federal (NOAA, DOI) Trustee agencies as well as, representatives from BP. Agencies and representatives of BP which choose not to participate in the sampling effort shall notify the LAT of their intent not to participate prior to team deployment. All activities and coordination between the Texas Trustee Council will be governed by the standing State / Federal MOU. It is not anticipated that any contract services other than those provided the Data Management Team, Sample Intake Team and approved Deepwater Horizon Laboratory will be required for this effort. The Texas Trustee Council will coordinate sampling efforts and participation with BP.

**Resource estimates for sample collection are as follows:**

**Transportation:**

(2) 20' boats & Trailers
(6) 4x4 Trucks / SUV

**Equipment:**

(4) 150qt ice chests
(8) 80 qt ice chests
Metal spoons/drip pans as re-useable sample collection tools
(3) Hand held GPS units
(3) Lensatic compass
(3) Digital cameras – with all cables, batteries and chargers
(3) Ponar, modified van Veen grab; Ekman grab; box dredge, shovels or coring devices.
(3) Spade or shovel
(3) Sieves & Screens
    Sieve – 1 mm mesh, rigid sides, big enough to hold full core.
    Box screen with 5 mm mesh (for collecting bivalves)
(3) 30m fiberglass tape measure, marked in cm
(30) Site markers (appropriate for substrate type) and surveying flags and tape
(3) Photo scales
(3) Hand counters

**Supplies:**

Forms, chain of custody, job aids and office supplies
NOAA Shoreline Assessment Job Aid
Texas NRDA baseline field data forms
Chain of custody forms and seals
(6) rolls clear packing tape
(6) rolls Teflon tape
(1) box waterproof markers
(1) box waterproof pens
(1) box waterproof notebooks

**Disposable sampling equipment & materials**

(28) pre-cleaned & packaged disposable sample scoops
(24) rolls pre-cleaned aluminum foil
(4) boxes 1 gallon heavy duty bags with zip lock closure
(6) boxes Nitrile gloves
(3) nylon brushes,
(24) rolls paper towel
(3) cases trash bags
(3) blocks sorbent pads
(3) rolls 8 mm 50 m plastic sheeting

**Sample containers**

(2) case pre-cleaned 1000ml amber glass jars
(6) cases 500ml, pre-cleaned, wide mouth amber glass jars with Teflon cap liners
(1) case 40ml, pre-cleaned, amber VOA vials with Teflon liners and septum cap
(2) case 125ml, pre-cleaned, wide mouth amber glass jars with Teflon cap liners
(2) cases whirl-paks
(6) Sample buckets – clean, minimum capacity of 2 pints, clear or opaque

**Reagents, cleaners and chemicals**

Ice for sample preservation
(3) gallon-sized HDPE cubitainers for clean rinse water
(3) bottles laboratory grade detergent for decontamination wash
(1) 5 gallons LCmS grade methanol for decontamination wash
(5) gallons formalin – standard biological preservative, 10% (in seawater, buffered) [Refer to e.g. Eleftheriou and Holme, 1984]

**Data Management Protocol and Processing for Field Samples**

Field sampling data, COC information, and photos will be uploaded into NOAA's NRDA sampling data management system. Sample and analytical data will be managed by the Data Management Team in an Access database throughout the NRDA process. The database output will be made into spatial data products such as ERMA and Google Earth for planning and communication purposes. Ensuring the samples' integrity by following the guidelines below will greatly improve this process. All sampling data, photos, and COC information should be uploaded by the end of the day on which they were collected as they will be used daily in the planning of future activities. The field survey team will use the following steps outlined in the NOAA Field Sampling Workbooks Guidance. All data forms shall be retained in accordance with agency and Unified Command data management protocols.

The Parties agree that the protocols set forth in this Baseline Sampling and Survey Work Plan comprise and represent appropriate and reliable scientific methodologies for obtaining data that may be used in assessing baseline conditions on the Texas coast prior to the Mississippi Canyon 252 (Deepwater Horizon) release. The Parties further agree that they will not object to or challenge the protocols specified in this Baseline Sampling and Survey Work Plan in any legal proceedings or any alternative dispute resolution process relating to the application of this Plan to the Trustees' claim for injured, destroyed, or lost natural resources resulting from the Mississippi Canyon 252 (Deepwater Horizon) release. Notwithstanding any parties' agreement with sampling procedures, the parties each reserve its right to produce its own independent interpretation and analysis of any data collected.

1. Data Sharing
   Each laboratory shall simultaneously deliver raw data, including all necessary metadata, generated as part of this work plan as a Laboratory Analytical Data Package (LADP) to the trustee Data Management Team (DMT), the Texas Parks & Wildlife Department (TPWD) on behalf of the Texas Trustee Council, the Louisiana Oil Spill Coordinator's Office (LOSCO) on behalf of the State of Louisiana and to ENTRIX (on behalf of BP). The electronic data deliverable (EDD) spreadsheet with pre-validated analytical results, which is a component of the complete LADP, will also be delivered to the secure FTP drop box maintained by the Trustees' Data Management Team (DMT). Any preliminary data distributed to the DMT shall also be distributed to TPWD, LOSCO and to ENTRIX. Thereafter, the DMT will validate and perform quality assurance/quality control (QA/QC) procedures on the LADP consistent with the authorized Quality Assurance Project Plan, after which time the validated/QA/QC'd data shall be made available to all Trustees and ENTRIX. Any questions raised on the validated/QA/QC results shall be handled per the procedures in the Quality Assurance Project Plan and the issue and results shall be distributed to all parties. In the interest of maintaining one consistent data set for use by all parties, only the validated/QA/QC'd data set released by the DMT shall be considered the consensus data set. The LADP shall not be released by the DMT, TPWD, LOSCO, BP or ENTRIX prior to validation/QA/QC absent a showing of critical operational need. Should any party show a critical operational need for data prior to validation/QA/QC, any released data will be clearly marked "preliminary/unvalidated" and will be made available equally to all Trustees and ENTRIX.

2. Laboratory to be used for Sample Analysis
   Unless otherwise agreed upon by the Trustees and BP, all samples will be sent to an approved Deepwater Horizon Laboratory.

3. Sample Identification
It is very important to have a common sample numbering system that is easily legible and provides a convenient means of tracking samples collected in the field. SSL sample stations shall be identified by adding the letter L to the closest Survey Station ID.

Sample identification format:

1. State abbreviation: TX
2. SCAT grid code
3. Date code (where A=2010) Ammdd
4. Survey station number (SSL = Survey station number + L)
5. Matrix: S(ediment), W(ater), T(issue / Biota), O(il), B(Tar Ball)
6. Series number: unique sequence number for the day
   EXAMPLE: TXBB08-A0720-01S001

4. Sample Shipping
All samples (Sediment, Water, Tissue, and Tar Balls) collected as part of this plan will be transported and shipped in accordance with the NRDA Sample Shipping Instructions MS Canyon 252 (Deepwater Horizon) Oil Spill guidance document.

5. Geographical Positioning Systems (GPS)
Field survey teams should have at least one GPS unit. Operations should be performed using the manufacturer's recommended receiver settings and observation times. Operations under adverse conditions, such as under a tree canopy or around urban environments where multipath conditions are high, may require longer observation times than those specified by the manufacturer. The appropriate type of GPS should be selected for the data to be collected. Sport grade units are generally acceptable for the identification of survey station locations and photo documentation. Differential or survey grade units are generally reserved for those applications where more definitive definition of the location, object or boundary is required (i.e. property surveys). The directions provided in this plan assume the use of sport grade GPS units for the collection of geographic location data. Differential or survey grade units may be used but are not required to collect data in differential mode. Should differential or survey grade data be uses, a supplemental work plan specifying data collection parameters will be generated.

a. Datum - All GPS units will be set to WGS 84. The World Geodetic System is a standard for use in cartography, geodesy, and navigation. It comprises a standard coordinate frame for the Earth, a standard spheroidal reference surface (the datum or reference ellipsoid) for raw altitude data, and a gravitational equipotential surface (the geoid) that defines the nominal sea level. The latest revision is WGS 84.

b. Position Information for Waypoints (LAT LON Format) - All GPS units should be set to Decimal Degrees (DD, d.dddd$^{o}$). Waypoints should be record to at least 4 decimal points. All waypoints should be recorded electronically in the GPS and in the field data forms / note books. In cases where accuracy may be low due to multipath or canopy obstructions, GPS units should enable or use their averaging function. A minimum of 20 readings should be taken when averaging is used.
c. All units should have Wide Area Augmentation System (WAAS) enabled.
d. At the beginning of the day all units should have their Track Log cleared. Track Logs should be enabled with a collection interval of at least every 30 seconds.
e. At the beginning of each day fresh batteries should be installed in all GPS or rechargeable battery packs verified for charge.
f. At the beginning of the day all GPS units should be placed in an open area and allowed to calibrate "warm up" for a minimum of 10 minutes. This is more critical for survey grade or differential units.
g. All teams should have at least one battery change for GPS unit or ability to recharge in the field.
h. All teams should save track logs and download GPS data at the end of the day. GPS units should be provided to the DMT for incorporation into the GIS database.
i. Any equipment failures or problems should be reported to equipment / data manager.

**Safety Plan**

All field operations will be conducted in accordance with all agency policies and in accordance with any safety plans and directives provided by the Unified Command for the Mississippi Canyon 252 (Deepwater Horizon) Oil Spill.

All personnel will be at least 24-hr HAZWOPER trained and have completed the 4-hour incident specific HAZWOPER training [redacted]. Float plans will be filed with the Deepwater Horizon IC and NRDA for each day's activities on the water. Coordination with the Deepwater Horizon Incident Operations will be achieved through completion of the NRDA shore ops tracker form to alert Ops to all NRDA field activities. All necessary PPE will be used.

## Cost Estimates

All teams will utilize agency staff and resources to complete the baseline survey. Contract services are not anticipated for sample collection. Sampling and travel are anticipated to take approximately one week to complete for each sampling event. Data management will be coordinated through the Deepwater Horizon NRDA data management teams and all samples will be handled through an approved Deepwater Horizon Laboratory. Identified costs for this plan do not include data management or laboratory costs.

Estimated Labor Costs

| Total Hourly Salary* | Hours / Day | Total Daily Salary Cost | Sample Days | Total Estimated Salary Cost/Team Member | Total Estimated Salary Cost/ Team** | Total Estimated Labor Cost |
|---|---|---|---|---|---|---|
| $52.50 | 8 | $420.00 | 5 | $2,100.00 | $10,500.00 | $31,500.00 |

Estimated Travel Costs***

| Lodging Allowance*** | Per Diem Rate *** | Total Daily Rate | Total Travel Days | Overnight Stays | Lodging / Person | Per Diem / Person | Total Travel Cost / Person | Total Travel Cost / Team | Total Field Team Travel Cost |
|---|---|---|---|---|---|---|---|---|---|
| $107.00 | $56.00 | $163.00 | 5 | 4 | $428.00 | $280.00 | $ 708.00 | $3,540.00 | $ 10,620.00 |
| | | | | | Total Estimated Labor and Travel Costs / Sample Event | | | | $ 42,120.00 |
| | | | | | Total Estimated Labor and Travel Costs for 3 Sample Events | | | | $126,360.00 |

Estimated Transportation Expenses

| Description | Daily Unit Cost | Number of Days | Total Unit Daily Cost | Number of Units Required | Cost / Sample Event | Number of Sample Events | Total Plan Cost |
|---|---|---|---|---|---|---|---|
| 23 FT. UTILITY BOAT | $1,000.00 | 2 | $2,000.00 | 2 | $4,000.00 | 3 | $ 12,000.00 |
| 4x4 Pickup Trucks/ SUV | $120.00 | 5 | $ 600.00 | 6 | $3,600.00 | 3 | $ 10,800.00 |
| | | | | Total Estimated Transportation Cost | | | $ 22,800.00 |

| | |
|---|---|
| Miscellaneous sampling consumables (ice, bubble wrap, coolers, glassware, etc.) | $3,000.00 |
| Total Estimated Field Expenses | $152,160.00 |

* Includes Fringe and Indirect Costs ** Based on 5 person teams ***Based on Texas GSA Rate

## Appendix A: SCAT Terminology

**Surface Oiling Descriptors (Covers)**

Trace <1% Visible oil
Sporadic 1 - 10% visible oil
Patchy 11 - 50% visible oil
Broken 51 - 90% visible oil
Continuous 91 - 100% visible oil

**Surface Oiling Descriptors – Thickness**

Stain (ST): Visible oil, which cannot be scraped off with fingernail.
Coat (CT): Visible oil <0.1 cm, which can be scraped off with fingernail
Cover (CV): Oil or mousse from >0.1 cm to <1 cm on any surface.
Pooled Oil (PO): Fresh oil or mousse > 1 cm thick.

**Surface Oiling Descriptors - Type**

Fresh Oil (FR): Un-weathered, liquid oil.
Mousse (MS): Emulsified oil occurring over broad areas.
Tar balls (TB): Discrete accumulations of oil <10 cm in diameter.
Tar Patties (TP): Discrete accumulations of oil >10 cm and <50cm in diameter.
Tar Mats (TM): Discrete accumulations of oil >50 cm in diameter.
Tar (TAR): Highly weathered oil, of tarry, nearly solid consistency.
Asphalt Pavement (AP): Cohesive, heavily oiled surface sediments.

## Appendix B: Texas NRDA baseline field data forms

**Deepwater Horizon NRDA**
**Texas Baseline Field Data Form**

Incident Safety Plan Available
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| **1. Survey Station** | Zone | Division | Location Description | Date (mm/dd/yy) | Time (Local/24 hr) | Tide Height_____ ☐Rising ☐Falling ☐Slack |
|---|---|---|---|---|---|---|
| | | | | | | |

| Team ID | Name, Organization, Phone | Name, Organization, Phone |
|---|---|---|
| | | |

| **2. Survey Station Waypoint GPS Coordinates** (WGS84 - Decimal Degrees 0.00000°) LAT (N) LON (W) | Waypoint ID | GPS Unit Type ☐Sports Grade ☐Other ☐Trimble (Differential) | Surveyed by ☐Foot ☐Boat ☐Air ☐Other |
|---|---|---|---|
| | | | |

**3. Water:** Oil observed on nearby water? ☐Yes ☐No If yes, check all that apply:

☐Silver Sheen ☐Rainbow Sheen ☐Mixed Sheen ☐Bio Sheen ☐Product

**4. Shoreline**: Oil observed on shoreline? ☐Yes ☐No

Shoreline Type: Select one primary (P) and all secondary (S) types. CIRCLE those oiled.

☐Marsh ☐Tidal Flat ☐Riprap ☐Sand/Shell Beach ☐Clay Bluff ☐Dune ☐Bulkhead/Manmade Structures ☐Other_____

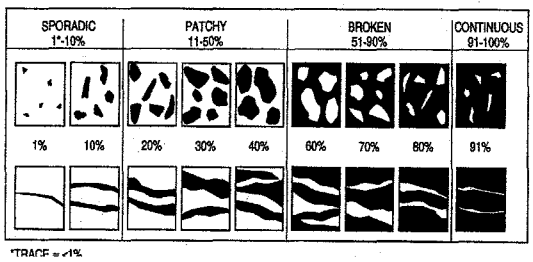
**5. Vegetation Type:** Check all that apply. Oil observed on vegetation? ☐Yes ☐No If yes, CIRCLE those oiled.

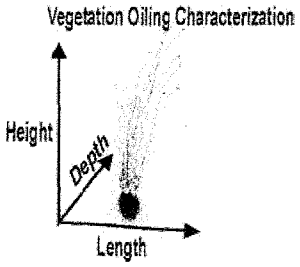
☐High Marsh ☐Emergent Marsh ☐Intermediate Marsh ☐Freshwater Marsh ☐SAV ☐Scrub/Shrub ☐Stranded Sargassum ☐Mangrove ☐Other ____

**6. Shoreline and Vegetation Oiling**

Stain = not scraped by fingernail
Coat < 0.1 cm
Cover 0.1-1 cm
Tar Balls < 10 cm
Tar Patties 10-50 cm
Tar Matts >50 cm

OIL COVER ESTIMATION CHART




| Habitat Zone | Shoreline Type | Tidal Zone | Shoreline Oil Cover | | | Shoreline Oil Thickness | | | | | Shoreline Oil Condition | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Length | Width | % Cover | Pooled | Cover | Coat | Stain | Sheen | Fresh | Mousse | Tar Ball | Tar Patty | Tar Matt | Tar | Asphalt |
| A....Z | | Lower Middle Upper Supra | ☐ft. ☐m. | ☐ft. ☐m. | | PO | CV | CT | ST | (S)ilver (R)ainbow (B)io | FR | MS | TB | TP | TM | Tar | AP |
| | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |

| Habitat Zone | Oil Banding | | Dominant Species | Vegetation Oil Cover | | | Vegetation Oil Thickness | | | | | Vegetation Oil Condition | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Start | End | | Length | Width | % Cover | PO | CV | CT | ST | FL | Bio | FR | MS | TB | TP | TM | Tar | AP |
| | in. from base of veg. | | | ☐ft. ☐m. | ☐ft. ☐m. | | | | | | Film | Sheen | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | |

**7. Qualitative Tar Ball Assessment** Area Surveyed: Approx. Length _____ m & Width _____ m

Starting Waypoint ID:_____ Ending Waypoint ID:_____ (WGS84 - Decimal Degrees 0.00000°)

Start LAT (N)_____ End LAT (N)_____

LON (W)_____ LON (W)_____

**Coordinate Observations Consistent with ICS Protocols.**

**Deepwater Horizon NRDA**
**Texas Baseline Field Data Form**

Incident Safety Plan Available
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**8. Physical Samples:** Samples split with RP? ☐Yes ☐No

Sample ID (TXSCAT ID-Ammdd-Media Team Code01 {Date Code A=2010})

| Sampler Initials | | | Sediment - Upper Intertidal Zone | Time Collected | Sediment - Middle Intertidal Zone | Time Collected | Sediment - Lower Intertidal Zone | Time Collected |
|---|---|---|---|---|---|---|---|---|
| __ | ☐ Sediment (PAH) | TX__ __ __ __ - | A07 __ __ - S | _____ | S__ __ __ __ | _____ | S__ __ __ __ | _____ |
| __ | ☐ Sediment (grain) | TX__ __ __ __ - | A07 __ __ - S | _____ | S__ __ __ __ | _____ | S__ __ __ __ | _____ |
| __ | ☐ Water (1 L PAH) | TX__ __ __ __ - | A07 __ __ - W | _____ | W__ __ __ __ | _____ | | |
| __ | ☐ Water(40 mL VOA) | TX__ __ __ __ - | A07 __ __ - W | _____ | W__ __ __ __ | _____ | | |
| __ | ☐ Tissue/Biota | TX__ __ __ __ - | A07 __ __ - T | _____ | | | | |

Waypoint ID:_____ (WGS84 - Decimal Degrees 0.00000°)

LAT (N) LON (W)

Benthic Depth Lower _____ (cm)
Benthic Depth Middle _____ (cm)
Benthic Depth Upper _____ (cm)

**9. Photographs:** Taken by (name, agency)_____ Photos # from _____ to _____

**10. Access Restrictions:**

**11. Wildlife** Check any observed dead and stranded wildlife: ☐Mammals ☐Birds ☐Fish ☐Reptiles ☐Invertebrates (crabs, etc.)

Observed presence of encrusting organisms? ☐Yes ☐No Observed presence of threatened and endangered species? ☐Yes ☐No

**12. Shoreline and Vegetation Description** (Make any sketches/diagrams on the TX NRDA Map Form)

Describe general condition and extent of oiling:

**13. Additional Observations/Measurements**

(Including any minor alterations or deviations from the protocols described in the Texas Baseline Survey and Sampling Work Plan)

**Deep Water Horizon NRDA**
**Texas Baseline Map Data Sheet**

Survey Station_____ Zone_____ Division_____

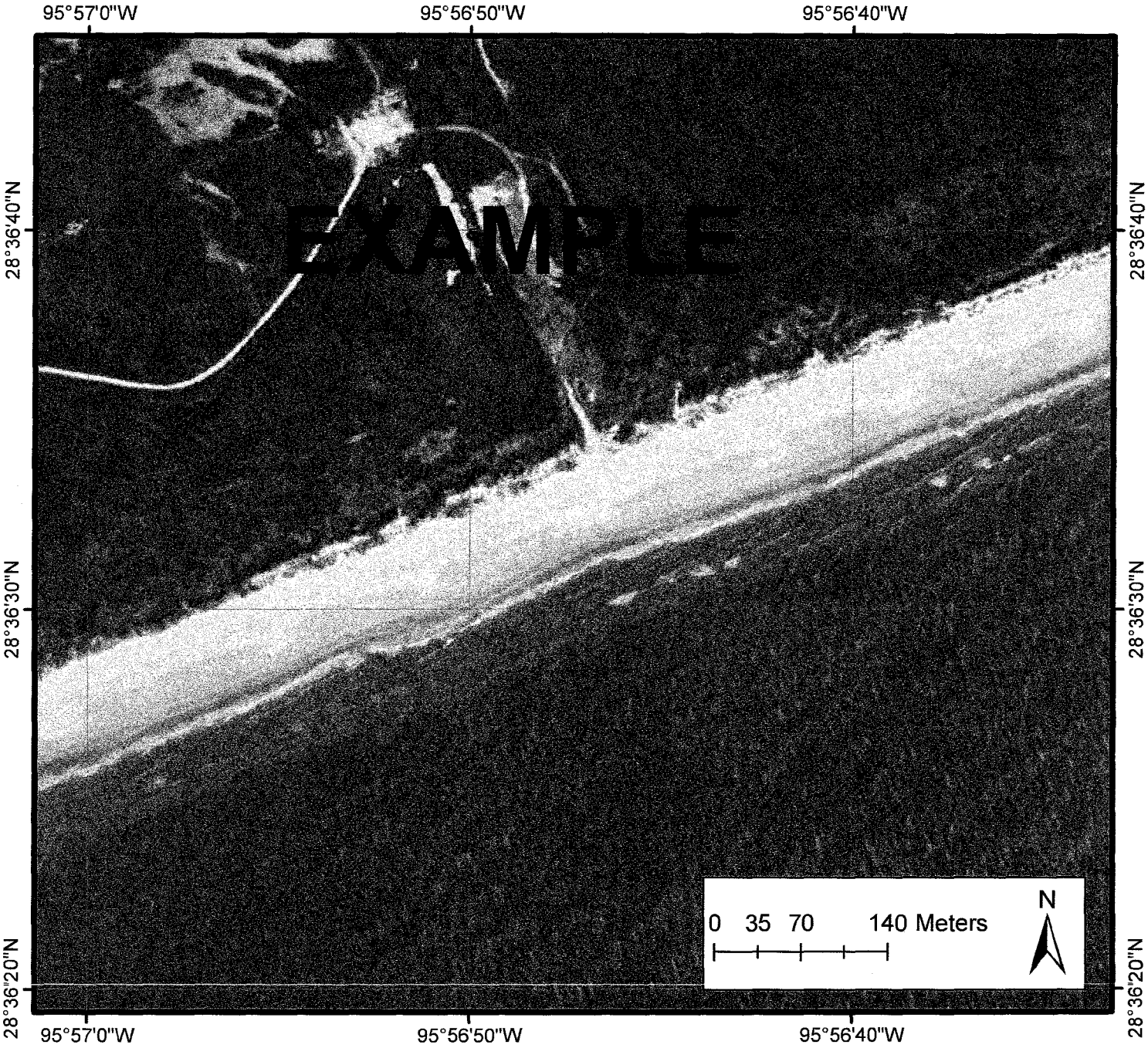
Team ID_____ Member Initials_____
Date (mm/dd/yy)_____Time (local/24hr)_____

Checklist:
___ Oil Distribution
___ High Tide Line
___ Low Tide Line
___ Substrate Types
___ Trench Locations

Labels:
1△ Trench number, No subsurface oil
2▲ Trench number Subsurface oil present
1●→ Photograph number and direction

Comments:

USE ONLY AS A GENERAL REFERENCE




Base Map Created Month, Day 2010