PROJECT SCOPE OF WORK

Natural Seep Water Sampling

M/V Ryan Chouest
Cruise 16

Deepwater Horizon Incident

Louisiana, Mississippi, Alabama and Florida Waters Gulf of Mexico

September 2010

Quality Control and MOC	
Issue Number and Date	**Issue Comments**
Version 1, September 12, 2010	Combined document for Crew Review
Authors	**Approved**
Name: Erich Houston Title: Chief Scientist, Ryan Chouest Name: Tony Parkin Title: Marine Science Coordinator	Name: Andy Hill Title: Manager, Physical Oceanography Sciences, GCRO

Scope of Work
Natural Seep Water Sampling
M/V Ryan Chouest

Version 1, September 12, 2010

Introduction

Natural hydrocarbon seeps are well known throughout the Gulf of Mexico and the purpose of this work is to acquire water samples for chemical analysis in the vicinity of hydrocarbon seeps.

It is believed that seabed seeps are emitting hydrocarbons into the waters of the Gulf of Mexico on an episodic basis. This project is designed to locate new seeps or re-occupy known potential seabed seep locations and collect water samples for chemical analysis in the water column immediately above the seabed.

NOTE - This plan is not intended to serve as a part of the Natural Resource Damage Assessment (NRDA) study program. NRDA studies will be undertaken by the natural resource trustees.

Project Objectives

The objective of this project is to chemically characterize the hydrocarbons being emitted from the seeps into the water column. This plan describes the methods used to locate the seeps, collect water samples and conduct onboard and laboratory based chemical analysis. The data from this program will be used to help determine the source of hydrocarbons that are present in the water and sediments in the Gulf of Mexico.

Sample Locations

The Ryan Chouest has been conducting seep detection for the past few months as part of the overall BP response activities and has developed a list of seep locations. These locations have been combined with known seep locations and are all detailed in Appendix 1.

Marine Science Coordinator: Tony Parkin - Anthony.Parkin@bp.com
410 474 9813

Offshore the overall responsible person for control and safe delivery of the survey operations is the Party Chief.

Chief Scientist: Erich Houston - Erich@metoc.co.uk
985 709 5779

The Chief Scientist will be responsible for overall delivery of the Science program aboard the vessel and laboratory safety. All safety incidents will be reported to the Party Chief for onward communication and action by COMPANY.

This is an *Adaptive Cruise Plan* requiring onboard decision-making based on real-time data analysis. The ultimate responsibility for data acquisition locations shall be agreed between the Chief Scientist and Party Chief on board discussions will be between the Chief Scientist and the Party Chief if necessary in discussion with the COMPANY Marine Science Coordinator.

Prioritization of testing will rest with the vessel Chief Scientist in consultation with the COMPANY Marine Science Coordinator.

Scope of Work
Natural Seep Water Sampling
M/V Ryan Chouest

Version 1, September 12, 2010

Overview of Methodology

1) Review previously collected data at select sites
2) Re-occupy and observe, if the seep is active as shown by the onboard fathometer
3) If active, deploy CTD and collect water samples
4) From each sample depth collect a subsample for onboard GC screening
5) From each sample collect water sample for laboratory analysis
6) If the screening shows a hydrocarbon detect then send sample to laboratory

The vessel will be equipped with a CTD and water sampling capability to collect samples and oceanographic data as detailed above to a depth of 6000 feet. The vessel has a complete science crew to conduct all sampling activities as well as conduct onboard water chemistry analysis using a Gas Chromatograph with a Mass Spectrometer (GCMS).

Each cruise will be a maximum of 5 days of sample collection due to limitations on holding times for samples and available sample storage place onboard the vessel.

Water Column Profile Sampling

At each location the vessel will be held on location as the CTD is deployed and lowered to a depth immediately above the seabed. Conductivity, temperature and fluorometery data from the CTD will be observed as the instrument is lowered and water sample depths will be decided upon data displayed by the sensors. The CTD instrument has a real-time depth indicator that shows the depth of the instrument beneath the surface. At a minimum, water samples will be collected as close to the seabed as possible in the area as close to the seep as possible. If the CTD data shows any significant anomalies such as sharp increases in fluorometery or sharp decrease in the level of dissolved oxygen in the water column then water samples will be collected at the targeted depths. If not samples will be collected at 50 and 100m off the seabed and then at mid depth during the up-cast.

Water samples will be collected from the Niskin bottles located on the CTD deployment frame and subsamples will placed in pre-cleaned sample jars in methods following the approved BP sample collection and handling procedures. From each depth, one sample will be collected for onboard GCMS screening and one sample will be collected for onshore laboratory analysis. If the onboard screening detects hydrocarbons, above background springs to mind but not sure if that is specific enough the second sample will be shipped to the laboratory.

Position Fixing: a Differential Global Positioning System (DGPS) fix shall be recorded at:

- The start of sampling at any sample station, *and* at
- The end of sampling at any sampling station.

The average of the two fix coordinates shall be recorded as the “final” recorded sample location in the sample logs.

A log of the following shall be kept by the on watch Surveyor on the bridge in a spreadsheet to include:

- Transect Number, if applicable
- Unique Sample Station Number [from the Science Team]

- Fix numbers (start and end of sampling) see below
- Average Latitude and Longitude for the location
- Water depth in feet of each sample
- Date
- Time (local)
- Surface Conditions (surface sheen, water, “Black” oil, mousse)
- General Location description
- Weather conditions to include:
  - Wind strength and direction
  - Current strength and direction of set
  - Wave height (feet)
  - Swell (feet)swell
  - Temperature,
  - Cloud cover (oktas).

The spreadsheet entries recorded by the on-watch surveyor shall be shared with the Chief Scientist on a regular basis.

DATA QUALITY / SAMPLING QUALITY CONTROL PLAN

This section provides guidance for data quality assurance for the collection of field samples and data collection.

All data collection shall be recorded in a bound laboratory notebook with numbered pages, per general laboratory practices.

Data or log entry errors will be stricken with a single line and will be initialled by the person making the correction.

Collection of all water samples will be documented to include:

- Sample number,
- DGPS location,
- Data,
- Time,
- Depth taken,
- Initials of sampler.

The sample number and sampling station shall be recorded on the Laboratory Management Program (LaMP) *“Project Information Form”* and *“Chain of Custody Record”* form, both which have been made available to the science crew via Excel spreadsheet.

Water samples that are not being analyzed onboard will be immediately stored (in I-Chem bottles) in an ice chest in order to maintain a targeted temperature of 4°C (+/- 0.5°C). Samples should not

be frozen. A thermometer will be available to remain with the aqueous samples in storage for monitoring purposes. Samples will not be acidified, and will be transferred to shore within 72 hours of collection for transport to the chemistry laboratory.as directed on the Analytical Request Form (ARF)

All water sample and data collection equipment will be visually inspected before sampling. Decontamination or replacement of equipment will occur when fouling of equipment is noted. And decontamination of sampling equipment will be conducted between each sample location. Any malfunction of data collection equipment or onboard testing shall be clearly documented.

Any onboard QA/QC issues will be resolved with the onboard Chief Scientist in consultation with BP's POC for Laboratory Quality Control:

Rock J. Vitale, CEAC, CPC
Consulting Chemistry
Environmental Standards, Inc.
Cell phone: 610-304-9972

DATA MANAGEMENT PLAN

Sample Data

Data that is collected ship-board will be received in electronic (spreadsheet or graphic) or paper format and will be incorporated into a field sampling database. Field sampling data will be recorded on the electronic field data form and emailed to MC252_deliverables@envstd.com as stated in SOP-03.

All laboratory chemical analysis that is performed on collected water samples (PAH Analysis) will be received in digital spreadsheet format and incorporated into the field sampling database. The laboratory electronic data deliverables (EDDs) will be delivered to MC252_EDD@envstd.com.

WASTE DISPOSAL

All waste generated as part of this operation, such as equipment wash water and consumables, will be handled in compliance with the Houma IC Waste Management Plan.

HEALTH AND SAFETY

All oncoming crew shall receive a safety briefing and vessel orientation upon joining the vessel.

The Party Chief with the Vessel Master shall hold a pre-sail safety session with all other crew members every morning prior to beginning field work. Other topics to cover shall include communication issues, air quality, biological and chemical hazards, weather hazards, shipboard hazards, equipment use, etc.

All crew members must sign a Pre-Sail Meeting Safety form to verify they attended the meeting and complete the Emergency Notification Form. Completed details shall be provided to the Vessel Owner, C&C Technologies and COMPANY each time the vessel departs port.

Anyone onboard has the right to "*STOP THE JOB*" if they feel work is unsafe, or they feel they do not understand the work that is about to be performed and their own role in it.

Any HSE incidents shall be properly recorded and fully investigated if deemed necessary UAC HSE Advisors.

The shipboard COMPANY Industrial Hygienist (IH) will review all Material Safety Data Sheets for hazardous materials used onboard and ensure that appropriate safety protocols are being observed. In addition the IH will assess health and safety issues for the cruise to ensure the safety of the team. The IH has the authority to put additional safety protocols in place as the need arises.

COMMUNICATIONS PLAN

This section outlines the basic communications event schedule for the monitoring cruise. The objective is to ensure clear communication between the vessel and the Unified Area Command (UAC) Environmental Unit.

Responsibility for Transfer of Scientific Data

Research Vessel: Chief Scientist – Erich Houston.
Unified Area Command Environmental Unit: Marine Science Coordinator – Tony Parkin

Summary of Scheduled Communication Events

Events	Scheduled Time	Frequency	Initiator	Recipient
Daily Situation Update	0900	Daily (vox)	UAC Marine Science Coord.	Party Chief / Chief Scientist
Daily Activity Summary	2000	Daily (vox)	Party Chief / Chief Scientist	UAC Marine Science Coord.
Significant Events: • HSE Incident • Program completion • Significant finding • Departure for Port	As Required	As Required	Either	Either
Daily Progress ReportDPR	2400	Daily (e-mail)	Party Chief / Chief Scientist	UAC Marine Science Coord.

Communication Protocols

The contact for scientific information and coordination is:

Tony Parkin: Scientific Cruise Coordination

UAC Environmental Unit
Cell phone: 410-474-9813
(subject to change with staffing changes)

Responsible for -

- Sharing all daily reports with the AC Environmental Unit representatives
- Coordinating all questions or requests for information related to the vessel research mission
- Integrating any changes to the original monitoring objectives into this adaptive cruise plan
- Coordinating transfer of samples to an approved laboratory for analysis

DEVIATION TO SCOPE OF WORK

All deviations from specification are to be immediately drawn to the attention of Marine Science Coordinator and pre-agreed with the UAC Science Team prior to continuing with the works.

Work shall not continue if agreement has not been reached on the acceptability or non-acceptability of the deviation to specification.

Appendix 1 – Potential Seep Locations

Cruise	X	Y
Cruise 8	-88.461825	28.656032
Cruise 8	-88.469927	28.663500
Cruise 8	-88.492737	28.698462
Cruise 8	-88.485228	28.687180
Cruise 8	-88.480865	28.679108
Cruise 8	-88.479492	28.676250
Cruise 8	-88.490593	28.692090
Cruise 8	-88.466857	28.658780
Cruise 8	-88.492748	28.690152
Cruise 8	-88.341843	28.678550
Cruise 8	-88.419895	28.677127
Cruise 10	-88.474613	28.680820
Cruise 10	-88.492668	28.851252
Cruise 10	-88.901846	28.850580
Cruise 11	-88.116870	29.934955
Cruise 11	-88.114362	29.948660
Cruise 11	-86.861032	30.325952
Cruise 11	-91.021130	28.142193
Cruise 11	-90.841800	28.141705
Cruise 11	-90.981920	28.140623
Cruise 11	-90.924470	28.140415
Cruise 11	-90.924190	28.108942
Cruise 11	-90.931423	28.090428
Cruise 11	-90.939218	28.088277
Cruise 11	-90.954045	28.093350
Cruise 11	-90.962272	28.075583
Cruise 11	-90.961878	28.104093
Cruise 11	-90.934990	28.088800
Cruise 11	-90.934782	28.091187
Cruise 11	-90.939502	28.083482
Cruise 11	-90.923513	28.089597
Cruise 11	-90.959698	28.106005
Cruise 11	-90.959698	28.092930
Cruise 11	-90.936800	28.086508
Cruise 11	-90.938597	28.076488
Cruise 11	-90.942012	28.092012
Cruise 11	-90.939012	28.089937

Cruise 11	-90.904098	28.103925
Cruise 11	-90.906813	28.110383
Cruise 11	-90.915585	28.110185
Cruise 11	-90.939178	28.088172
Cruise 11	-90.940922	28.047362
Cruise 11	-90.922495	28.089943
Cruise 11	-90.907220	28.118655
Cruise 11	-90.907098	28.002777
Cruise 11	-90.967223	28.072298
Cruise 11	-90.956523	28.071820
Cruise 11	-91.030293	28.089658
Cruise 11	-91.009660	28.089718
Cruise 11	-90.927270	28.090983
Cruise 11	-90.916990	28.103455
Cruise 11	-90.967085	28.103045
Cruise 11	-90.998467	28.103600
Cruise 11	-91.037732	28.104398
Cruise 11	-91.037732	28.104398
Cruise 11	-90.907937	28.116765
Cruise 11	-90.899377	28.117955
Cruise 11	-90.981653	28.140810
Cruise 11	-91.028932	28.083132
Cruise 11	-88.491467	28.852150
Cruise 11	-88.491467	28.852150
Cruise 11	-88.068893	28.850033
Cruise 11	-88.902467	28.850367
Cruise 11	-88.902167	28.850450
Cruise 11	-88.751533	28.868550
Cruise 11	-88.932183	28.883917
Cruise 11	-88.924950	28.854333
Cruise 11	-88.902667	28.850117
Cruise 11	-88.902713	28.850390
Cruise 11	-88.903210	28.859533
Cruise 11	-90.346550	28.773261
Cruise 11	-90.940407	28.094324
Cruise 11	-90.941927	28.085117
Cruise 11	-90.293767	28.671623
Cruise 11	-90.277618	28.684812
Cruise 11	-90.240853	28.724815

Cruise 12	-88.670090	29.276818
Cruise 12	-88.901950	28.849898
Cruise 12	-88.253120	29.646223
Cruise 12	-88.249263	29.654878
Cruise 12	-88.233840	29.695933
Cruise 12	-88.231118	29.703897
Cruise 12	-88.227152	29.715263
Cruise 12	-88.224895	29.721732
Cruise 12	-88.169563	29.881065
Cruise 12	-88.128715	29.982020
Cruise 12	-88.060247	30.100215
Cruise 13	-88.100845	29.904263
Cruise 13	-88.101160	29.901527
Cruise 13	-88.101290	29.900113
Cruise 13	-88.106792	29.834342
Cruise 13	-88.564020	29.231692
Cruise 13	-88.564283	29.231185
Cruise 13	-88.579565	29.205910
Cruise 14	-88.493442	28.851468
Cruise 14	-88.491732	28.852202
Cruise 14	-88.903345	28.849173
Cruise 14	-88.902201	28.850173
Cruise 15	-88.080633	30.002708
Brooks CGP168	**-88.46937667**	**28.66189833**
Brooks CGP222	**-88.64916167**	**28.65224333**
Brooks CGC106	**-88.16491500**	**28.49949500**
Brooks CGC109	**-88.17616167**	**28.61582167**