Research Vessel Brooks McCall

Interim Summary Report May 30th 2010

Cruises 1 - 4, May 7th – 26th 2010

Monitoring Water Quality and Chemistry in the Vicinity of the MC252 Oil Spill Location

1. Summary

This note is an interim report of the results of testing conducted to assess the effect of subsea dispersion use during the MC252 Oil Spill. BP is working closely with the U.S. Coast Guard, EPA, and NOAA to implement, review and adjust the plan for subsea dispersant monitoring.

The available data shows:

1. There are very low concentrations of hydrocarbons, measured in the range of not detectable, effectively 0, to a maximum known spike of 72 parts per billion, in the water column below the visible oil slick on the surface. This means there is no coherent body of hydrocarbons beneath the surface.

2. Dissolved Oxygen measurements are greater than the lower limit set in the applicable documents governing the use of subsea dispersants.

3. Toxicity experiments conducted during the cruises show that the impact on the test species is less than the EPA test threshold. This means the samples are not toxic to the specific species tested. Water from the samples taken to date would have no significant affects on aquatic life.

4. When subsea dispersant is applied, there is less oil reaching the surface as a slick. In turn, the amount of aerial dispersant required to minimize coastal impact has been reduced by a significant amount.

2. Conclusions

BP's interim conclusion is that the use of subsea dispersant is safe, efficient and effective. The basis of this conclusion is the data gathered to date, presented in this and accompanying reports, and fully disclosed each day to the USCG, EPA and NOAA.

The EPA has provided the public with an excellent and comprehensive report regarding Dissolved Oxygen (DO). The EPA has concluded:-

- "Based on this analysis, we conclude that we currently have no credible evidence to support the theory that DO concentrations are abnormal in the immediate vicinity of the oil spill."

Reference: - http://www.epa.gov/bpspill/dispersants/bp-do-methods.pdf

More data and information on dispersant use is at:

http://www.epa.gov/bpspill/dispersants.html.

3. Intent

When this crisis occurred, the U.S. Coast Guard (USCG) and EPA granted BP authorization to use an approved dispersant from the EPA approved list on oil present on the surface of the water in an effort mitigate the impact of the spill[1]. This authorization included specific conditions to ensure the protection of the environment and the health of residents in affected areas.

The EPA and the USCG have also authorized BP to use dispersants underwater at the source of the Deepwater Horizon leak. Direct observations indicate that subsurface use of the dispersant is effective at reducing the amount of oil that reaches the surface. Subsea dispersant has had a positive effect on the safety of workers on vessels as the amount of Volatile Organic Compounds (VOCs) has remained below critical limits during application.

While BP is using subsurface dispersants the federal government requires regular analysis of its effectiveness and impact on the environment, including a monitoring plan the company must adhere to. The USCG and EPA have reserved the right to discontinue the use of this underwater dispersant method if any negative impacts on the environment outweigh the benefits. The data reported here directly supports the daily determination for continuation of deep sea dispersant injection, as requested by EPA.

In addition, this program also determines the extent and chemical and physical characteristics of the dispersed plume water quality and will inform future hydrodynamic transport models.

[1] See the National Contingency (NCP) Plan Subpart J – Product Schedule at
http://www.epa.gov/emergencies/content/ncp/index.htm#testing
http://www.epa.gov/emergencies/content/ncp/tox_tables.htm

4. Program

Monitoring Objectives

1. Confirm location and extent of any subsurface concentration of hydrocarbons.

2. Determine how much oil (total PAH[2]) remains in the dispersed plume.

3. Collect physical oceanographic data to validate sub-surface dispersed hydrocarbon models.

Overview of Methodology

This field survey and monitoring plan has been adapted from the EPA recommendations provided to the Area Command on May 6th 2010.

Vessels

- **RV Brooks-McCall**

This vessel performed all of the sampling work in 4 Cruises between May 7th 2010 and May 26th 2010. Cruise 1 was a pilot program during which the crew tested equipment, methods and reporting processes. A significant equipment upgrade took place before Cruise 2, May 15th to 18th. BP, NOAA and EPA scientists now take continuous measurements and recover discrete water samples throughout the interval from sea surface to the sea bed 5000 ft below. This report is a summary of the data analysed to date from Cruises 2 to 4.

Specific details of Cruises 2 to 4, including every Conductivity Temperature, Depth (CTD) plot, can be found at the following location under the heading "Dispersant-Related Sampling." In addition, BP will post future data from the next cruises of the Brooks McCall at the same site.

http://www.bp.com/sectiongenericarticle.do?categoryId=9033792&contentId=7062347

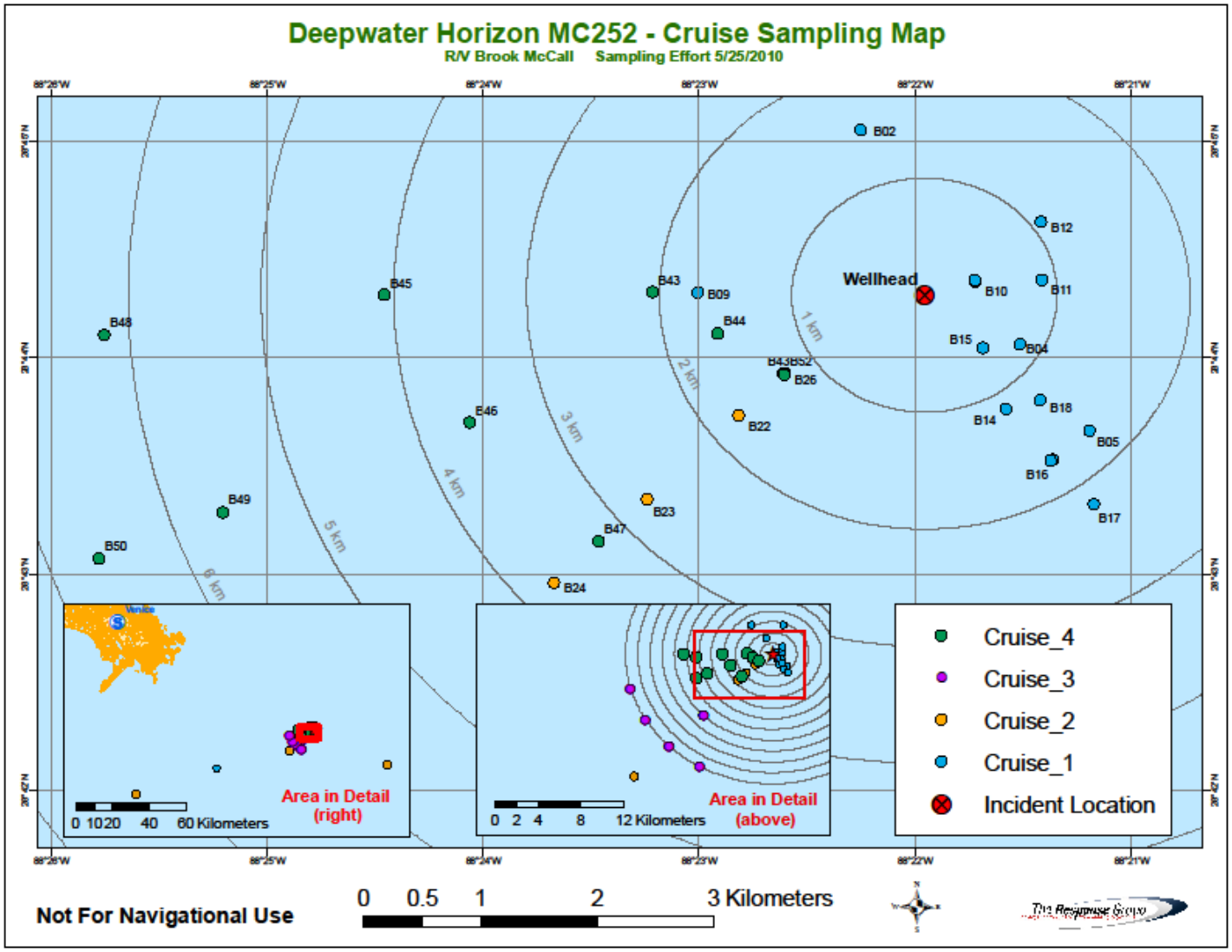
- **Ocean Veritas**

On May 26th a second, newly fitted vessel, the Ocean Veritas, sailed to join the monitoring effort and now provides uninterrupted back-to back monitoring with the RV Brooks McCall in the vicinity of the subsea leak. BP will post data from the Ocean Veritas Cruise 1, and its following cruises, at the site referenced above.

[2] Polycyclic Aromatic Hydrocarbons

Sampling Grid

The map below shows the stations sampled in the Brooks McCall Cruises 1 through 4. Note that one location has had repeat visits. Stations B26 (5/17), B43 (5/23), and B52 (5/25) are all very nearly at the same location and provide insights into changes over time and / or local variability. Those data show the intensity of the fluorimeter anomaly changes from 27 to 16 to 9 parts per billion over the 8 day period.



Scientists used the most recent computer modeling results of the spatial extent of the dispersed plume to determine the initial sampling grid pattern. That model indicated that 1km (kilometer) spacing would be appropriate for initial location of the dispersed plume. Once the plume was located, the grid pattern was refined to a sample density adequate to delineate the plume boundaries. The science team used information collected at the sample locations to refine the sampling grid. In addition, the team uses the real time observed data to improve the forecasts of new runs of the computed plume transport model. These data include:

- Fluorometry results
- Conductivity, Temperature and Depth (CTD) cast results.
    - Dissolved Oxygen measurements from the water samples
    - PAHs and Total Petroleum Hydrocarbons (TPH)
    - Oil Particle sizes
    - Acute Toxicity
- Deep water current information from Acoustic Doppler Current Profilers (ADCP) onboard other vessels in the vicinity.

- **Coordination of Testing Activities**

This is an adaptive cruise sampling plan requiring onboard decision making based on real-time data analysis. The responsibility for data acquisition and prioritization of testing rests with the BP Chief Scientist on board. He or she takes these decisions in full consultation with NOAA and EPA colleagues on board, and the shore-based support team at Area Command.

- **Detection and delineation of dispersed plume**

Fluorimeter (cast, not towed): Utilize fluorimeter to delineate horizontal and vertical extent of any subsurface hydrocarbon. The science team "casts" the fluorimeter at locations based on the dispersed modeling and the other real-time information that affect the monitoring operation. The fluorimeter records continuous data from surface to a water depth of 5000 feet.

Particle Size Analysis: Utilize a Laser Suspended Sediment Concentration Sensor (LISST-ST Particle Size Analyzer) to delineate the horizontal and vertical extent of any subsurface hydrocarbon. The LISST-ST analyzer measures this property of the water column at various locations of the affected area. Survey points are co-located with fluorometry monitoring, when feasible.

UV-Fluorescence: The science team collects and analyzes water samples to provide real-time data on the presence or absence of total petroleum hydrocarbons. In certain circumstances, it may be possible to determine the effectiveness of the subsea dispersant application by characterizing chemically versus naturally dispersed oil in the water sample.

Acute Toxicity: The science team conducts a rapid, 24-hour acute toxicity test using the marine rotifer *Brachionus plicatilis* on the ship. Note that all toxicity tests are very difficult to perform shipboard.

- **Water column sampling collection**

The team collects multiple water samples at varying depths throughout the water column using a collection device called a "rosette[3]." The water samples are large enough for the following analyses. When appropriate, the on board team collects pressurized water samples in line with ASTM and USGS published procedures.

Total Polyaromatic Hydrocarbon (PAH) analysis. Samples are transported to the accredited and BP-approved laboratory at LSU for analysis.

Dissolved Oxygen (DO): DO is monitored at depth with a sensor and verified shipboard with collected water sample dissolved oxygen testing.

A defined Water Quality Profiling plan controls the water column sampling program.

- **Physical oceanographic data collection**

CTD: Conductivity Temperature and Depth (CTD) measurements determine water column stratification or other physical oceanographic parameters.

Currents: Numerous Acoustic Current Doppler Profilers (ACDP) units are located throughout the area of interest. The physical oceanographers incorporate data from these devices, which measure subsea currents, into the monitoring effort and computer models of the dispersed plume.

5. Preliminary Data Summary

To date many analyses are still in progress with only limited data available. Information on dissolved oxygen, hydrocarbon by fluorometry and limited Rotifer toxicity testing have been used for daily operation decisions and is presented in the table below.

[3] See the basic information at http://www.bp.com/liveassets/bp_internet/globalbp/globalbp_uk_english/incident_response/STAGING/local_assets/downloads_pdfs/ctd.ppt

		Data Source	Brooks McCall Cruise Science team - NOAA, EPA, & BP representatives on					
Cruise #	Date	**Sample Location ID**	Hydrocarbon Concentration in Water Maximum observed at Station , Fluorometry Reading, ppb	Depth Below Sea Level (m)	Minimum Dissolved Oxygen mg/l Observed At Station	Depth Below Sea Level (m)	Toxicity Results	Depth Below Sea Level (m)
2	15-May-10	**Station B20**	41	1290	3.7	375	No Available Data	
2	16-May-10	**Station B21**	18	1280	3.7	375	No Available Data	
2	16-May-10	**Station B22**	19	1190	3.6	400	No Available Data	
2	16-May-10	**Station B23**	16	1170	3.6	370	No Available Data	
2	16-May-10	**Station B24**	33	1300	3.7	370	No Available Data	
2	17-May-10	**Station B25**	8 (background)	NA	3.7	410	No Available Data	
2	17-May-10	**Station B26**	27	1280	3.6	320	No Available Data	
2	17-May-10	**Station B27**	14	1270	3.7	350	No Available Data	
2	17-May-10	**Station B28**	11	1290	3.7	350	No Available Data	
3	19-May-10	**Station B29**	10	1320	3.6	375	No Available Data	
3	19-May-10	**Station B30**	11	1250	3.6	300	No Available Data	
3	19-May-10	**Station B31**	8 (background)	NA	3.7	300	No Available Data	
3	19-May-10	**Station B32**	18	1250	3.6	350	No Available Data	
3	19-May-10	**Station B33**	9	1150	3.6	360	No Available Data	
3	20-May-10	**Station B34**	9	1190	3.6	425	No Available Data	
3	20-May-10	**Station B35**	9	1300	3.5	400	No Available Data	
3	20-May-10	**Station B36**	20	1150	3.7	375	Impact less than Theshold	100 and 1300
3	20-May-10	**Station B37**	12	1160	3.5	375	No Available Data	
3	21-May-10	**Station B38**	20	1200	3.6	360	No Available Data	
3	21-May-10	**Station B39**	8 (background)	NA	3.7	430	No Available Data	
3	21-May-10	**Station B40**	8 (background)	NA	3.7	350	No Available Data	
3	21-May-10	**Station B41**	25	1280	3.6	350	No Available Data	
4	23-May-10	**Station B42**	22	1150	2.6	400	Impact less than Theshold	0, 600, 1050, 1200, 1250
4	23-May-10	**Station B43**	15	1220	2.6	400	No Available Data	
4	23-May-10	**Station B44**	21	1210	2.7	400	No Available Data	
4	24-May-10	**Station B45**	18	1150	2.6	405	No Available Data	
4	24-May-10	**Station B46**	15	1230	2.7	390	Impact less than Theshold	0, 500, 1100, 1228, 1400
4	24-May-10	**Station B47**	6	1550	2.7	400	No Available Data	
4	24-May-10	**Station B48**	13	1280	2.6	400	No Available Data	
4	25-May-10	**Station B49**	12	1280	2.7	400	No Available Data	
4	25-May-10	**Station B50**	13	1200	2.7	400	No Available Data	
4	25-May-10	**Station B51**	14	1190	2.7	400	No Available Data	
4	25-May-10	**Station B52**	9	1255	2.7	420	No Available Data	

There are no Dissolved Oxygen data points with values below 2.0 mg/l. This indicates that the water in and about the dispersed plume is aerobic and able to support the usual aerobic organisms present in the water column.

Toxicity data, although limited, indicates samples of the oil with dispersant collected at differing depths have no meaningful effect on the marine rotifer, *Brachionus plicatilis.* Test results with undiluted samples from the dispersed plume show no more mortality than that observed in control samples. Hydrocarbon concentration determined by fluorometry has concentrations that have maximum recorded spikes below 75 parts per billion or micrograms / liter. BP's current opinion is that these very low concentrations do not have a significant effect on marine life.

6. Plans for Continued Monitoring

BP, USCG, NOAA and the EPA plan to continue the monitoring program described here with the RV Brooks McCall and the Ocean Veritas for the foreseeable future. Continued monitoring is a requirement during sub-surface dispersant injection operations. When the flow of oil from the Deepwater Horizon leak point into the Gulf of Mexico is stopped, sampling will continue in order to monitor changes over time.