



BP Exploration & Production Inc.
501 Westlake Park Boulevard
Houston, Texas 77079

March 25, 2011

VIA EMAIL AND U.S. MAIL

Robert Haddad, Chief
National Oceanic and Atmospheric Administration
Office of Response and Restoration
Assessment and Restoration Division
7600 Sand Point Way NE
Seattle, WA 98115-0070

RE: ROV sediment corer and biota collection for December NRD Cooperative Cruise

Dear Bob:

On December 7, 2010, BP Exploration & Production LLC ("BP"), through Cardno ENTRIX, provided comments to the Trustees proposing changes to the sediment corer decontamination methods described in Attachment 6 to the NOAA/BP-ENTRIX NRDA/Cooperative Deep Tow Cruise 2 -- December 2010 Arctic-HOS Davis 5-Sarah Bordelon Cruise Plan ("December Cooperative Cruise Plan"). On the same day, the Trustees responded to BP's comments; the Trustees' response is attached to this letter. The differences between BP and the Trustees regarding these decontamination methods were not resolved by the Trustees' response because of timing issues related to ensuring that the December Cooperative Cruise could be completed in time for the holidays. As a result, the December Cooperative Cruise proceeded without signature of either BP or any of the Trustees. It is BP's understanding, based on reports from CardnoENTRIX staff who were on board, that during the December Cooperative Cruise the Trustees' actual practice in some instances deviated from the decontamination methods contained in their December 7, 2010, response. BP understands further that these deviations have the potential to result in cross-contamination of the sediment samples, especially samples which contained significant oil residues.

The purpose of this letter is to place into the administrative record BP's reservations regarding the decontamination methods contained in the Trustees' December 7, 2010, response, and regarding the decontamination methods that we were actually implemented with respect to sediment sampling performed on the December Cooperative Cruise. BP is otherwise in agreement with the Trustees regarding the December Cooperative Cruise plan and is prepared to sign the plan as a cooperative study except with respect to Attachment 6. BP does not agree to the sediment decontamination procedures as drafted in Attachment 6 and the method performed during the December Cooperative Cruise. BP's comments on Attachment 4 of the *March-April 2011 HOS Sweetwater ROV Sediment and Bottom-Water Sampling Cruise Plan* reflect the procedures BP finds acceptable.

Below are responses to the Trustees' December 7, 2010 comments to Attachment 6 of the December Cooperative Cruise Plan that articulate BP's concerns regarding the sediment corer decontamination methods indicated therein. In what follows below, BP provides responses to several specific Trustee comments and edits, which are indicated by page and/or paragraph number and which are attached to this letter. In addition, where relevant, BP also provides comments regarding sediment decontamination methods BP understands (based on reports from CardnoENTRIX staff who were on the cruise) were actually performed on the December Cooperative Cruise.

1. Appropriateness of Proposed Decontamination Methods at Sea

The Trustees made the following general comment on page 2 regarding BP's overall proposed sampling equipment decontamination methods:

"I am not certain, but this procedure was probably not designed for operations at Sea. From what I can tell these procedures are typically performed in a shore based laboratory, and modifications are required for at-sea work."

BP Response to Trustee Comment:

The procedures have been appropriately adapted for use at sea, including small volume use of hexane as necessary for oiled conditions, dispensing from squeeze bottles that have been pre-filled, and storage in flame proof cabinets on vessels in accordance with the project Health & Safety Plan. Hexane is a standard and appropriate final rinse after methanol in order to ensure removal of trace nonpolar components. We recommend that its use be made discretionary depending on oiling conditions and not often used but is made available for times when less rigorous techniques may not be adequate for full decontamination if oil is encountered.

2. When Equipment Must be Decontaminated

The Trustees made the following redline changes to BP's proposed language on page 2, paragraph 4, which appeared to result in requiring decontamination only when sampling equipment is visibly stained:

~~"Sampling equipment that comes into contact with sample matrices will be further decontaminated before use to minimize cross-contamination. Sampling~~
equipment visibly stained with oil or other hydrophobic material will be further decontaminated before use to minimize cross-contamination. While performing the decontamination procedure, phthalate-free gloves, such as nitrile or butyl rubber, will be worn. Sampling equipment will be decontaminated in the area designated for decontamination."

BP Response to Trustee Revision:

Not all oil/hydrocarbon/hydrophobic material contamination may be visible. Decontamination should be conducted after every sampling event to prevent potential cross-contamination of samples.

3. Sediment Decontamination Procedures

The Trustees revised BP's proposed sediment decontamination procedures with the following redline changes and comments:

~~The decontamination procedure followed by EPA Region II (EPA Region II, CERCLA Quality Assurance Manual, October 1989, Revision 1), will be used before each sampling event for sampling equipment which will come into contact with the media to be sampled. The EPA Region II procedures are summarized below. will proceed as follows:~~

- Wash and scrub core tubes with detergent
- Tap water/distilled water rinse
- Tap water/distilled water rinse
- An acetone only rinse or a methanol (~~followed by hexane~~)rinse (solvents must be pesticide grade or better)

[The Trustees commented that “[t]his [rinse with hexane] is probably not feasible without a chemical hood. Even the acetone will be problematic.”]

- Thorough de-ionized (analyte-free) water rinse (if available; otherwise use distilled water)

[The Trustees stated that “[b]eing as all sampling devices are exposed to water during descent, I don't see that this rinse step is useful. Also, de-I water is tricky on boats.”]

- ~~▪ Wrap in aluminum, shiny side out, for transport.~~

[The Trustees stated that foil wrapping “does not make sense”.]

Sampling equipment being used to collect samples for polycyclic aliphatic hydrocarbon (PAH), total petroleum hydrocarbon (TPH), or volatile organic carbon (VOC) analyses will utilize the methanol rinse. If samples are collected only for biological or geotechnical laboratory testing, (e.g., grain size) the sampling equipment will only be rinsed with tap or distilled water after washing with low-phosphate detergent solution.

BP Responses to Trustee Revisions:

In general, BP believes that standard EPA approved decontamination procedures should be followed. In addition, not rinsing with hexane is not a problem in open air conditions when used with prescribed PPE as appropriate for specific conditions at time of application in the established decontamination zone (per Site H&S Plan). BP recommends that the hexane rinse be optional and conducted as necessary after contact by the equipment with visibly contaminated media that prevents complete decontamination at trace levels using the standard procedure. Use of a nonpolar solvent such as hexane as an optional final rinse when sampling gear has contacted visibly contaminated sediment is a standard procedure in the industry. There is no reason to allow for less stringent procedures on this project, particularly when specified as optional under special conditions.

With respect to transporting the equipment, if the large coring tubes are not capped then the ends should be covered with foil until used to ensure that the insides are not exposed to environmental contaminants between sampling locations (including dust, ship exhaust, etc). This is an industry standard procedure and one that has a practical application in protecting against that very small chance of something falling in, adhering, or otherwise somehow contaminating the next sample, including an oil smear. This procedure will help to prevent not being able to attest that such a possibility did not exist because there was no barrier.

BP Comments on Trustees' Actual Sediment Decontamination Practices

BP understands from CardnoENTRIX staff onboard during the December Cooperative Cruise that the sediment sampling equipment decontamination methodology performed onboard the HOS Davis during the December Cooperative Cruise deviated in some instances even from the methodology the Trustees indicated they were to follow as listed in Attachment 6. BP believes that these deviations have the potential to result in cross-contamination of the sediment samples, especially samples which contained significant oil residues. These deviations are described below:

1. Inadequate decontamination of coring devices with solvents prior to deployment of sampling equipment

Actual decontamination of the coring devices prior to deployment consisted of the following steps:

- Spray with water from the boat hose (potable water) to remove visible sediment
- Liquinox scrub (sponge brush) or hand wash
- Rinse in bucket of water
- Final spray with water from the boat hose (potable water)
- Coring devices were remounted onto ROV after decontamination

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Decontamination of the coring devices with methanol occurred twice under the following circumstances:

- After an oil lubricant was found on the seals
- After a hydraulic oil leak occurred while the ROV was deployed underwater

Despite being required under Attachment 6, distilled/de-ionized water was not used in any rinses. Acetone or methanol generally was not used for decontamination even though oil/sheen was visible in the sediment samples.

2. Inadequate decontamination of sampling equipment between sample collections

Decontamination of the aluminum shims, plastic measurement rings and rubber pole in between core samples involved the following steps:

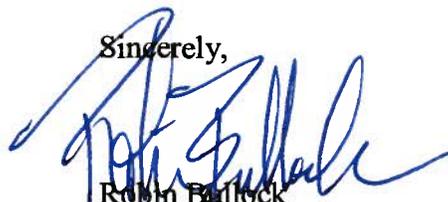
- Spray with water from the boat hose (potable water) to remove visible sediment
- Liquinox hand wash
- Rinse in bucket of water
- Final spray with water from the boat hose (potable water)

Despite being required under Attachment 6, distilled/de-ionized water was not used in any rinses. Acetone or methanol was not used for decontamination, even though oil/sheen was visible. Reuse of the same slicing shim could result in cross-contamination among "slices" in a core.

* * * *

Thank you very much for your attention to BP's concerns regarding this matter.

Sincerely,



Robin Bullock
NRD Director

Enclosure

cc: Troy Baker (NOAA)
Drue Banta (LACP&R)
Robert Barham (LDWF)
Bennet Bearden (GSA)
John Carlucci (DOI)

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Harriet M. Deal (DOI)
Cynthia K. Dohner (USFWS)
Lee Edmiston (FDEP)
Trudy D. Fisher (MDEQ)
Garret Graves (LCPRA)
Roland Guidry (LOSCO)
Will Gunter (ALDCNR)
Bob Harper (LDNR)
Peggy Hatch (LDEQ)
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Craig R. O'Connor (NOAA)
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Don Pitts (Texas Environmental Assessment Response and Restoration Program)
Christopher J. Plaisted (NOAA)
M. E. Rolle (NOAA)
Dr. Nick Tew (GSA)
Jean Martin (BP)
Larry Malnor (BP)
Brian Israel (Arnold & Porter LLP)
Joe Kakesh (Arnold & Porter LLP)

Water Column Injury Ephemeral Data Collections:
Deepwater Horizon Oil Spill (DWHOS)

Plan for Adaptive Water Column NOAA-NRDA Sampling (PAWNNS)
ROV Benthic Sediment Core and Biota Collection

December 7, 2010

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Sediment Sampling Methodology:

Sediment Corer

A sediment coring system will be mounted to the ROV. The sediment coring system consists of core tubes 6.5 cm in diameter (inside diameter) capable of taking samples down to a sediment depth of 10 cm (Figure 1). Six core tubes will be mounted to the ROV frame during each dive descent and ascent. Once at the seafloor, the ROV actuates one core tube at a time and insert into the sediment. Each core tube is outfitted with a floating seal on the upper end (not inserted into the seabed). This floating seal allows water to flow out of the tube during insertion. As the tube is pulled from the seafloor the upper floating seal locks into place due to suction. This prevents loss of the sediment sample during recovery. The core is then retracted to its initial location and sealed at the bottom with a tension mounted foot plate. The mounts consist of a metallic surface and create a cap for the lower end of the tube inserted into the sediment. Thus, effectively both ends of the core tube are capped for ascent of the ROV.

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Figure 1. Sediment core tube, floating seal cap (detached), and ROV core mount or holster.

Cores for Chemical Analysis

On deck in the ship's laboratory, cores will be extruded using a plunger system (see Sediment Core Extrusion: SOP's, Annex 1). Cross sections of sediment will be sliced from the core removing first the top flocculent layer (~1 cm), then slicing at 2-4cm down (from the original top of the core), followed by a slice at 5-6 cm down (from the original top of the core); targeting obvious color or texture changes for divisions. The remaining sediment will be divided into segments no larger than 4cm; this will be dependant on total depth of core and may vary.

Cross sections will be placed in pre-cleaned glass jars and kept frozen until shipment to Alpha Analytical for detailed chemical analyses and fingerprinting. Sample horizons will be clearly labeled and documented in the sample log (see Annex 2).

Sampling Equipment Decontamination

Decontamination of each core tube will be carried out by washing equipment with soap and water on board between uses. Coring equipment and tubes will be rinsed with fresh water from the vessel, and then rinsed with seawater during descent on the ROV to the sampling site.

Sampling equipment visibly stained with oil or other hydrophobic material will be further decontaminated before use to minimize cross-contamination. While performing the decontamination procedure, phthalate-free gloves, such as nitrile or butyl rubber, will be worn. Sampling equipment will be decontaminated in the area designated for decontamination.

The decontamination procedure will proceed as follows:

- Wash and scrub core tubes with detergent
- Tap water/distilled water rinse
- Tap water/distilled water rinse
- An acetone only rinse or a methanol rinse (solvents must be pesticide grade or better)
- Thorough de-ionized (analyte-free) water rinse (if available; otherwise use distilled water).

Sampling equipment being used to collect samples for polycyclic aliphatic hydrocarbon (PAH), total petroleum hydrocarbon (TPH), or volatile organic carbon (VOC) analyses will utilize the methanol rinse. If samples are collected only for biological or geotechnical laboratory testing, (e.g., grain size) the sampling equipment will only be rinsed with tap or distilled water after washing with low-phosphate detergent solution.

Solvents used during decontamination activities (e.g., iso-octane) will be collected and handled in accordance with the procedures outlined in the QAPP.

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Comment [A1]: I am not certain, but this procedure was probably not designed for operations at Sea. From what I can tell these procedures are typically performed in a shore based laboratory, and modifications are required for at-sea work.

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Deleted: must be used in order to prevent phthalate contamination

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Comment [A2]: This is probably not feasible without a chemical hood. Even the acetone will be problematic.

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Comment [A3]: Being as all sampling devices are exposed to water during descent, I don't see that this rinse step is useful. Also, de-I water is tricky on boats.

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Comment [A4]: This does not make sense.

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Sediment analysis will be by methods and for analytes described in the MC252 Analytical Quality Assurance Plan Version 2.1, Section 1.0 (Attachment 9). These are:

- Analysis and reporting for PAHs including alkyl homologues by gas chromatography with low resolution mass spectrometry using selected ion monitoring (GC/MS-SIM). The analytical procedure is based on EPA Method 8270D with the GC and MS operating conditions optimized for separation and sensitivity of the target analytes. Alkyl PAH homologues are quantified using a response factor assigned from the parent PAH compound. Analytes, associated response factors and target detection limits are listed in Table 1.1a.
- Analysis and reporting for saturated hydrocarbons by gas chromatography with flame ionization detection (GC/FID) based on EPA Method 8015. Analytes and target detection limits are listed in Table 1.1b.
- Acquisition of data for petroleum biomarkers by GC/MS-SIM. The target analyte list for quantitative biomarkers is provided in Table 1.1e.

Due to the size of the core cross sections, grain size analysis will not be carried out (cores 1-2cm thick by 6.5cm in diameter). Total organic carbon (TOC) will be analyzed if enough sample mass is leftover after the aforementioned sediment analyses are conducted. Alpha Analytical has indicated that TOC can be analyzed with as little as 1g of sediment sample, but 5g is preferable.

Cores for Biological Analysis

On deck in the ship's laboratory, biological cores will be extruded using a plunger system, as described above for the cores taken for chemical analysis. If biological cores are paired with chemistry cores, the same depth intervals will be sliced such that the sample depth ranges are matched. One quarter of the core cross-section will be placed in a pre-cleaned glass jar and frozen, while the remaining material will be rinsed with seawater, placed in a second pre-cleaned glass jar and preserved in formalin. Sample horizons will be clearly labeled and documented in the sample log (see Annex 2). Decontamination procedures described above will also be followed (allowing all corers to be utilized interchangeably).

Cores for Grain Size Analysis

On deck in the ship's laboratory, cores taken for grain sized will extruded in their entirety, their contents placed in pre-cleaned glass jars, and stored at room temperature. Samples will be clearly labeled and documented in the sample log (see Annex 2). Decontamination procedures described above will also be followed (allowing all corers to be utilized interchangeably).

Sediment grain size analysis will be by methods described in the MC252 Analytical Quality Assurance Plan Version 2.1 (Attachment 9).

ROV Biota Collection:

If large epibenthic macrofauna or other easily attainable biota is encountered by the ROV while surveying the seafloor, the ROV arm will be used to collect it. This exercise will test methods for obtaining samples with the ROV available on the HOS Davis. Biota samples will be collected and archived for possible future tissue analysis.

A scooping device will be secured to the ROV arm to gather specimens from the seafloor. Specimens will be placed into a plastic basket fixed onto the top of the TMS frame. This basket will be lined with small wire mesh to contain the sample and minimize water turbulence while still allowing for pressure changes during dive descent and ascent. The lid of the basket will be rigged with a lead weight like a trap door so that collected specimens are secured during ROV ascent.

On deck collected specimen samples that do not maintain continuity and shape due to pressure changes will be placed in 500 mL pre-cleaned jars. Samples that do maintain form will be wrapped in aluminum foil and double-bagged in zip-lock baggies. All biota samples will be kept frozen. Frozen samples will be shipped to Alpha Analytical Laboratories in Mansfield, MA, and archived. Analyses on tissue samples include alkylated PAH, saturated hydrocarbons (SHC), and biomarkers, as described in the MC252 Analytical Quality Assurance Plan Version 2.1 (Attachment 9).

Annex 1. Sediment Core Extrusion: Standard Operating Procedures:

I. Purpose

This section describes the extrusion, sectioning and sample collection of discrete sediment layers after collection with the ROV sediment coring devices. This allows chemical analysis of different layers and isolation of freshly deposited materials from background contaminants.

II. Sampling Technique

During ROV ascent, gather supplies and begin setup.

Need equipment/supplies:

- Table
- Aluminum foil
- Tongue depressors
- Wide-mouth 500ml sample jars
- Sample photo logs (appendix 1)
- Digital camera
- 5 gallon bucket
- Sediment core plunger
- Nitrile gloves

**Nitrile gloves should be worn at all times throughout sampling procedure

Process and photograph each sediment core completely before moving on to the next corer.

1. Station set up:
 - 1.1. Cover table surface work area with aluminum foil.
 - 1.2. Place bucket at end of table for disposal of excess sediment and materials.
 - 1.3. Make sure the boat is positioned so that the wind is coming from a direction that avoids blowing diesel exhaust into the sampling area.
2. Photograph 1: Entire corer.
 - 2.1. Each corer has a colored handle (top). This colored handle (top) should be included in the first photograph taken for each sample series.



Figure 2. Photograph 1 - Overview of complete corer including colored handle.

3. Photograph 2: Total core length

3.1. Include cm scale in photograph to record total core length. Record total core length on sample log. (Table 1)



Figure 3. Photograph 2 - cm ruler adjacent to core before extrusion.

4. Remove top:
 - 4.1. Carefully remove handle of corer (top) while holding the bottom with a gloved hand.
 - 4.2. Insert plunger into bottom of corer.
 - 4.2.1. If there is an abundance of fluid on top of the sediment, this may be decanted and disposed of or sampled at the discretion of the lead scientist.
 - 4.3. Use plunger to slowly push entire contents of corer towards the top.
 - 4.4. Take another photograph with the cm ruler next to the core pushed up inside the core barrel.
5. Photograph 3: Top layer of sediment prior to collecting sample.
 - 5.1. Include labeled jar lid in this photograph.
6. **Include labeled lid in photograph for all subsequent layer samples** (i.e. each time a new layer is started).
 - 6.1. Lid should be labeled with a signifier that identifies the color of the corer (in this case "W" for white) and a letter/number that identifies the layer (here "A" for the topmost sediment layer.)
 - 6.2. This will help link photographs to the different cores and depths later on during photo processing.



Figure 4. Photograph 3 - Upper layer before extrusion with labeled sample lid.

7. Sediment Sample 1:
 - 7.1. Use tongue depressor to collect top 1cm of sediment as first sample. In some cases, the top layer might have a "soupy" consistency and may require decanting into the sample jar. Include descriptions of the sample's length, odor, texture, and color on sample log (Table 1).
8. Sample 2:
 - 8.1. Use the plunger to extrude the next 2cm layer of sediment.
 - 8.2. Photograph layer with sample jar lid.
 - 8.3. Use tongue depressor to collect sediment into sample jar.
9. Sample 3:
 - 9.1. Use the plunger to extrude the next 2cm layer of sediment.
 - 9.2. Photograph layer with sample jar lid.

9.3. Use tongue depressor to collect sediment into sample jar.

10. Subsequent Samples:

10.1. The remaining sediment should be divided into segments no larger than 4cm. Any obvious change in sediment type (color, consistency, texture, etc) indicates the need for a new subsample and sample container.

10.2. In the event that the remaining sediment appears to be homogeneous, extrude the contents onto the aluminum foil and collect the center most 2cm segment as a representative sample (Photograph 4). Discard remaining portions into 5 gallon bucket.



Figure5. Photograph 4 - Extruded core bottom on Al foil for sub-sampling center section of homogeneous bottom layer.

11. Sample jars [for sediment chemistry and TOC analyses](#) should be labeled and stored in a freezer once sampling is complete.

