Re: FW: NEWS ON FRTG -- scientist statement

Martha N Garcia to: christopher.t.o'neil 06/10/2010 09:31 AM

Cc: Marcia K McNutt, Mark K Sogge

Dr McNutt asked that I respond to your merssage on methods being used, new sources of data, roster of who's doing the work, etc. I've included bullets initially written following the release of the FRTG's preliminary report, attached below. The report includes the roster of Team Members. For additional info on current efforts, I've provided, at the end of this email, the short responses we prepared on questions following CAPT Lloyd's testimony yesterday. Let me know if I can provide additional information or clarify this information. I am detailed at the NIC and can be reached at 703 589-4096 or found in room 3208.

Summary

- These are all preliminary estimates derived by scientists using three independent methods.

- The overlap of the three flow rate estimates is between 12,000 and 19,000 barrels per day, with one method indicating it may be 25,000 barrels per day or higher.

Amplifying

- Three independent methods considered by the FRTG place the minimum oil flow rate at greater than 12,000 barrels per day.

- Two of the methods determine that the flow rate could be as high as 19,000 barrels per day.

- The team using video to analyze the plume believes that the flow rate could be 25,000 barrels per day or higher.

- The FRTG continues to work to refine these estimates and to provide an upper bound from the plume analysis.

Background

- In arriving at this preliminary range of values, the FRTG pursued three entirely independent strategies, each of which yielded it own range of values.

- The values from the independent methods were combined to find the mostly likely range of flow rates for the well from the intersection of different methods.

- The Plume Team pursued the approach of observing video of the oil/gas mixture escaping from the kinks in the riser and the end of the riser pipe, using particle image velocimetry analysis to estimate fluid velocity and flow volume.

- The Mass Balance Team used remote sensing data from deployment of the

Airborne Visible InfraRed Imaging Spectrometer (AVIRIS) and satellite to calculate the amount of oil on the ocean surface on a certain day. The team then corrected the value for oil evaporated, skimmed, burned, and dispersed up to that day and divided by time to produce an average rate.

- The third method provided a "Reality Check" for the Plume Team and Mass Balance Team estimates. This method provided a lower bound on the flow rate by incorporating the flow of oil from the RITT (Riser Insertion Tube Tool) to the *Enterprise* , the ship collecting the hydrocarbons from the RITT, combined with observations of the oil still leaking from the riser when the RITT was inserted. Flow meters calibrated by a third party (e.g., not BP) measured the amount of gas and oil contained in the plume from which their average percentage was calculated, which helped the team convert total plume volume to flow of oil.

If asked about differing scientific opinions:

- The FRTG was assembled on the principle that, given the complexity of estimating a flow rate at 5000 feet below the surface of the water, many different scientists and approaches should be brought together to try to find best estimates at this point in time.
- Dr. McNutt indicated that there are and will continue to be, differing estimates and conclusions within the group.
- Differences among the estimates of each team within the group, and of individual scientists within the FRTG represent a healthy and important part of the process that will continue to help us get closer to more and more accurate estimates.
- The FRTG continues to work to refine these estimates and to provide an upper bound from the plume analysis.

Q&A #3331: Please provide the most recent flow-rate estimate promulgated from NIC/FRTT and the date of that estimate.

The Flow Rate Technical Group (FRTG) is going to release later today (June 10) new assessments for the flow rate for the Deepwater Horizon well both pre-rise cut and post-riser cut. The new assessments will include both lower and upper bounds for the FRTG team analyzing video and a slight revision in the bounds for the team which conducted the mass balance assessment. For the time being, the NIC is using a value of 19,000 barrels of oil per day pre-cut and 21,000 barrels per day post-cut of the riser (to account for modest loss of impedance) for the flow from the well based on their May 27th best estimate.

(NIC-HQ) Q&A #3332: Was this estimate following the completion of the current top-hat/vented containment system? If not, is there an anticipated timeline or estimate forthcoming on a new estimate?

The estimates to be released later today (June 10) will include the flow estimate after the removal of the riser. The current top hat containment system is recovering approximately 15,000 to 17,700 barrel of oil per day (BP makes these numbers public and they are being posted on a DOE web site). Therefore, after the completion of the top hat containment system, the release of oil is the difference between the revised oil estimates and the amount being contained by the top hat.

(NIC-HQ) Q&A #3333: Is the NIC or FRTT aware of any independent or contracted flow-rate estimates outside of their own work? If so, by whom - and please comment on the FRTT's evaluation of these estimates as appropriate.
The NIC and FRTG are aware and using estimates of total flux from the well provided by a team from Woods Hole Oceanographic Institution. Those results will also be reported publically later today and incorporated into the assessment of oil release rate.

Martha N. Garcia, Chief of Staff
Senior Advisor for Biology

U.S. Geological Survey
12201 Sunrise Valley Drive
National Center, MS 301
Reston, VA 20192
http://biology.usgs.gov

(703) 648-6960
(703) 648-4039 fax
mgarcia@usgs.gov

-----Marcia K McNutt/DO/USGS/DOI wrote: -----

To: Martha N Garcia/BRD/USGS/DOI@USGS
From: Marcia K McNutt/DO/USGS/DOI
Date: 06/10/2010 08:17AM
cc: Mark K Sogge/DO/USGS/DOI
Subject: FW: NEWS ON FRTG -- scientist statement

Martha -

Could you please do this for the Lietenant Commander? The new estimates will primarily be derived from video and the WHOI sonar/ADCP measurements. Ground truth may also come from some differential pressure measurements from the Top Hat but that is still a TBD.

Thanks.

Marcia

From: christopher.t.o'neil@uscg.mil [mailto:christopher.t.o'neil@uscg.mil]
Sent: Thursday, June 10, 2010 7:51 AM
To: <mcnutt@usgs.gov>; "Grawe, William" <William.R.Grawe@uscg.mil>; "Russell, Anthony LCDR" <Anthony.L.Russell@uscg.dhs.gov>; "McPherson, James CAPT" <James.B.McPherson@uscg.mil>; "Greene, Lawrence CDR" <Lawrence.E.Greene@uscg.mil>
Subject: RE: NEWS ON FRTG -- scientist statement

Rgr.
In advance of the actual estimate, could someone please pass to me some bullets about methods being used, new sources of data, roster of who's doing the work, etc.
I'd really like to have some messaging crafted/vetted before the announcement.
v/r

C. T. O'Neil
Lieutenant Commander, U.S. Coast Guard
Chief, Strategic Communications, National Incident Command
Chief of Media Relations (CG-09222)
2100 2nd St. S.W., Stop 7362
Washington, DC 20593-7362
202-372-4635 / 202-285-5127

Supporting mission execution through excellence in communication
www.USCGNews.com
www.uscg.mil

-----Original Message-----
From: mcnutt@usgs.gov [mailto:mcnutt@usgs.gov]
Sent: Wednesday, June 09, 2010 10:09 PM
To: O'Neil, Christopher LCDR
Subject: RE: NEWS ON FRTG -- scientist statement

Thurs pm
I hope

From: christopher.t.o'neil@uscg.mil [mailto:christopher.t.o'neil@uscg.mil]
Sent: Wednesday, June 09, 2010 10:02 PM
To: "Marcia K McNutt" < mcnutt@usgs.gov>
Subject: RE: NEWS ON FRTG -- scientist statement

Roger ma'am ... So I'm clear that would be friday afternoon?

Sent with Good (www.good.com)

-----Original Message-----
From: Marcia K McNutt [mailto:mcnutt@usgs.gov]
Sent: Wednesday, June 09, 2010 09:13 PM Eastern Standard Time
To: O'Neil, Christopher LCDR
Subject: RE: NEWS ON FRTG -- scientist statement

(I don't think we are going to have the post-riser-cut numbers until 3
pm)

From: christopher.t.o'neil@uscg.mil
[mailto:christopher.t.o'neil@uscg.mil]
Sent: Wednesday, June 09, 2010 8:42 PM
To: "Martha Garcia" < mgarcia@usgs.gov>; "Grawe, William"
< William.R.Grawe@uscg.mil>
Cc: "LaBrec, Ronald CAPT" < Ronald.A.LaBrec@uscg.mil>; "McPherson, James
CAPT" < James.B.McPherson@uscg.mil>; "Greene, Lawrence CDR"
< Lawrence.E.Greene@uscg.mil>; < mcnutt@usgs.gov>; "Moland, Mark CDR"
< Mark.G.Moland@uscg.mil>; "Mark K Sogge" < mark_sogge@usgs.gov>;
< Julie_Rodriguez@ex.ios.doi.gov>; < Catherine_Cesnik@ex.ios.doi.gov>;
< David_Behler@ex.ios.doi.gov>; "Barbara W Wainman" < bwainman@usgs.gov>;
"Judy J Nowakowski" < jnowakowski@usgs.gov>; "Vic Hines"
< vhines@usgs.gov>; "Kyle W Moorman" < Kyle.Moorman@mms.gov>
Subject: RE: NEWS ON FRTG -- scientist statement
Importance: High

Following up,
I've not received any product with which to begin crafting messages, comms plan.
Have two national level media inquiries pending, one seeking comment by Friday.

Thanks
v/r

Good afternoon all,
This is a NIC level announcement, as the FRTG is a NIC element.
Messaging needs to be conducted collaboratively at the NIC level.
DOI PA would be welcome member of the NIC STRATCOM team, and I'm standing by to develop comms plan and messaging.
The JIC needs visibility, but does not have time to develop comms plan or strategy.
Very respectfully,

C. T. O'Neil
Lieutenant Commander, U.S. Coast Guard
Chief, Strategic Communications, National Incident Command
Chief of Media Relations (CG-09222)
2100 2nd St. S.W., Stop 7362
Washington, DC 20593-7362
202-372-4635 / 202-285-5127
Supporting mission execution through excellence in communication
www.USCGNews.com
www.uscg.mil

-----Original Message-----
From: mgarcia@usgs.gov [mailto:mgarcia@usgs.gov]
Sent: Wednesday, June 09, 2010 12:10 PM
To: Grawe, William
Cc: Allen, Thad ADM; Neffenger, Peter RDML; LaBrec, Ronald CAPT; McPherson, James CAPT; O'Neil, Christopher LCDR; Watson, James RADM; Nash, Roy RDML; Greene, Lawrence CDR; mcnutt@usgs.gov; Moland, Mark CDR; Mark K Sogge; Julie_Rodriguez@ex.ios.doi.gov; Catherine_Cesnik@ex.ios.doi.gov; David_Behler@ex.ios.doi.gov; Barbara W Wainman; Judy J Nowakowski; Vic Hines; Kyle W Moorman
Subject: Re: NEWS ON FRTG -- scientist statement

Bill, My understanding is that the PR is being developed at DOI and will be vetted through the JIC. I'll pass on any updates as they are received.

Martha N. Garcia, Chief of Staff
Senior Advisor for Biology

U.S. Geological Survey

12201 Sunrise Valley Drive (703) 648-6960
National Center, MS 301 (703) 648-4039 fax
Reston, VA 20192 mgarcia@usgs.gov
http://biology.usgs.gov < http://biology.usgs.gov/ >

-----William.R.Grawe@uscg.mil wrote: -----

To: "Allen, Thad ADM" < Thad.W.Allen@uscg.mil>, "Neffenger, Peter RDML" < Peter.V.Neffenger@uscg.mil>, "LaBrec, Ronald CAPT" < Ronald.A.LaBrec@uscg.mil>, "McPherson, James CAPT" < James.B.McPherson@uscg.mil>, "O'Neil, Christopher LCDR" < christopher.t.o'neil@uscg.mil>, "Watson, James RADM" < James.A.Watson@uscg.mil>, "Nash, Roy RDML" < Roy.A.Nash@uscg.
From: "Grawe, William" < William.R.Grawe@uscg.mil>
Sent by: William.R.Grawe@uscg.mil
Date: 06/09/2010 11:58AM
cc: "Greene, Lawrence CDR" < Lawrence.E.Greene@uscg.mil>, "Martha Garcia" < mgarcia@usgs.gov>, < mcnutt@usgs.gov>, "Moland, Mark CDR" < Mark.G.Moland@uscg.mil
Subject: NEWS ON FRTG -- scientist statement

Admirals,

Dr. McNutt is looking into the below news announcement! FYSA

Martha...will want to coordinate any press release developed in response to this statement with the Joint Info Center (JIC).

V/R,

Bill Grawe

-----Original Message-----
From: mgarcia@usgs.gov [mailto:mgarcia@usgs.gov]
Sent: Wednesday, June 09, 2010 11:12 AM
To: Moland, Mark CDR
Subject: Re: news on FRTG

Ira Leifer, a member of the FRTG is making news. I heard that he was quoted in the WA Post and WA Times. Found this online

"According to a scientist on the government's Flow Rate Technical Group, the mess BP made got worse when it tried to fix it. It has gotten so bad that Ira Leifer, an associate researcher at the Marine Science Institute of
the University of California says that it could be leaking as much as 100,000 barrels a day"

The whole story can be found
at: http://blogs.alternet.org/grantlawrence/tag/ira-leifer/<
http://blogs.alternet.org/grantlawrence/tag/ira-leifer/ >

mark, I've sent this to our communications group to see if DOI or USGS
are
planning to put out a PR. Will let you know

Martha N. Garcia, Chief of Staff
Senior Advisor for Biology
301 National Center
Reston, VA 20192
mgarcia@usgs.gov
703 648-6960
703 648-4039 fax

Sent from my BlackBerry Wireless Handheld (www.BlackBerry.net)

Summary_Preliminary_Report_from_the_FRTG_FINAL.docx

Summary Preliminary Report from the Flow Rate Technical Group
Prepared by Team Leader Marcia McNutt, U.S. Geological Survey

Three independent methods considered by the FRTG place the minimum oil flow rate at greater than 12,000 barrels per day. Two of the methods determine that the flow rate could be as high as 19,000 barrels per day. The team using video to analyze the plume believes that the flow rate could be 25,000 barrels per day or higher. Therefore, the area of overlap of all three methods ranges between **12,000 to 19,000 barrels per day**. These are all preliminary estimates.

In arriving at this preliminary range of values, the FRTG pursued entirely independent strategies, each of which yielded it own range of values. The values from the independent methods were combined to find the mostly likely flow rate for the well from the intersection of different methods. The Plume Team pursued the approach of observing video of the oil/gas mixture escaping from the kinks in the riser and the end of the riser pipe, using particle image velocimetry analysis to estimate fluid velocity and flow volume. The Mass Balance Team used remote sensing data from deployment of the Airborne Visible InfraRed Imaging Spectrometer (AVIRIS) and satellite to calculate the amount of oil on the ocean surface on a certain day. The team then corrected the value for oil evaporated, skimmed, burned, and dispersed up to that day and divided by time to produce an average rate. Each method has its own limitations and biases as described below.

Plume Modeling: at least 12,000 to 25,000 barrels per day (range of lower bounds)

The plume modeling team observed video from both the end of the riser where the majority of the flow is escaping and from the kink in the riser where a smaller amount exits through small slits in the top of the riser. The main method employed to make their estimates was through a common fluid dynamic technique called particle image velocimetry (PIV). While difficult in practice, it is simple in principle. In this method a flow event, e.g. an eddy or other identifiable item, is observed at two consecutive video frames. Distance moved per time between frames gives a velocity, after adjustment for viewing angle and other factors. Repeated measurement over time and space give an estimated mean flow. Flow multiplied by cross-section area of the plume gives a volume flux.

The challenges this team faced in getting reliable results were many. First, they only had a limited window of data in time to choose from. They had to select data from before the RITT was inserted into the riser as that tool captured a variable amount of flow. They needed a time window when application of subsea dispersant was not perturbing the flow. They required footage from after the period when a trench was excavated at the end of the riser to better expose the end of the plume. Most challenging was getting good lighting and unobstructed views of the plumes from work-class ROV's not intended to capture research-quality footage and occupied doing other tasks at the time.

Second, perfecting the methodology for calculating multiphase flow (oil, water, gas, hydrate in poorly known ratios) under very high pressure is worthy of a research effort. This is not a turn-key project, and yet the team did not have the luxury of time to explore many alternative approaches or calibrate methods with deep-sea tests using known fluxes of fluids in prescribed ratios. A key parameter was the average ratio of gas to liquid. This term seemed to vary over the time period of the spill. Increasing gas increased the velocity of the plume but decreased the mass flow. Lacking independent estimates, the group took the average values provided by BP at face value. Analysis of the available short movies of

the raiser flow shows the existence periods when the flow oscillates from pure gas to seemingly pure oil. This appears to be an indication of Slug Flow Regime. These periods of gas-oil flow fluctuation are in the range of minutes but could also be in the range of hours or even as long as days. In order to properly determine the effect of the intermittency of the gas/oil composition in the total estimate of the oil discharged from the riser leak, the analysis should be extended to long video records spanning several days.

The plume modeling team observed video from both the end of the riser where the majority of the flow is escaping and from the kink in the riser where a smaller amount exits through small slits in the top of the riser. The main method employed to make their estimates was through a common fluid dynamic technique called particle image velocimetry (PIV). While difficult in practice, it is simple in principal. In this method a flow event, e.g. an eddy or other identifiable item, is observed at two consecutive video frames. Distance moved per time between frames gives a velocity, after adjustment for viewing angle and other factors. Repeated measurement over time and space give an estimated mean flow. Flow multiplied by cross-section area of the plume gives a volume flux.

The challenges this team faced in getting reliable results were many. First, they only had a limited window of data in time to choose from. They had to select data from before the RITT was inserted into the riser as that tool captured a variable amount of flow. They needed a time window when application of subsea dispersant was not perturbing the flow. They required footage from after the period when a trench was excavated at the end of the riser to better expose the end of the plume. Most challenging was getting good lighting and unobstructed views of the plumes from work-class ROVs not intended to capture research-quality footage and occupied doing other tasks at the time.

Second, perfecting the methodology for calculating multiphase flow (oil, water, gas, hydrate in poorly known ratios) under very high pressure is worthy of a research effort. This is not a turn-key project, and yet the team did not have the luxury of time to explore many alternative approaches or calibrate methods with deep-sea tests using known fluxes of fluids in prescribed ratios. A key parameter was the average ratio of gas to liquid. This term seemed to vary over the time period of the spill. Increasing gas increased the velocity of the plume but decreased the mass flow. Lacking independent estimates, the group took the average values provided by BP at face value.

Not all of the experts engaged in PIV analysis. Some simply reviewed the work of those that did, while still others provided additional verification by checking the PIV answers with their calculations using other techniques. Given the challenges in applying the methods in to this particular problem, team members concluded that formal statistical error bounds on upper and lower limits on flow volume derived from a rigorous estimation of the uncertainty in model parameters would fail to capture all possible sources of error in this approach to recovering the true flow rate. It would only account for the known unknowns, but not the unknown unknowns that might be revealed if one could actually calibrate these methods against a known flow rate given the complex multiphase and flow behaviors at high pressure. The experts concluded that the effect of the unknown unknowns made it more difficult to produce a reliable upper bound on the flow rate. Therefore, they chose to simply produce a range of lower bounds from their independent analyses, all of which they thought were defendable. A formal error analysis by one member of the plume team estimated that the uncertainty in any one estimate (e.g., from the "known unknowns") would be $\pm 40\%$.

Mass Balance: 12,000 to 19,000 barrels per day

The mass balance team used data from the AVIRIS airborne sensor flown over the Gulf of Mexico on May 17, 2010. The sensor can map both the aerial extent and thickness of oil by observing changes in reflectance that occur in the near infrared because oil absorption is less in that waveband. AVIRIS can only observe a portion of the total spill area in one day, and there is some uncertainty in estimating what proportion of the total spill area is represented in the scene that is imaged. On May 17, the mass balance team calculates that they observed 15% of the total spill, and assumes that the portion they observed is representative of the total spill. An adjustment is made for additional dull oil and sheen that coat the surface in fairly uniform layers too thin to be sensed by AVIRIS but from other sensors have been shown to persist in known ratios to the area of the thick oil (88:10:2 for sheen to dull oil to thick oil). On May 17, the amount of thick oil was 70,000 to 150,000 barrels. Bounds on the contribution of sheen and dull oil that need to be added to those totals are 60,000 to 120,000 barrels depending on reasonable thicknesses chosen for sheen and dull oil. Therefore, lower and upper bounds on the oil spill on May 17 are between 130,000 and 270,000 barrels of oil. This is the amount of oil that poses the largest threat to the coastal environment, and a large proportion of the oil released after this date was either disperser subsea or collected with the riser insertion tube tool (RITT).

Corrections are then made for the amount of oil that was evaporated, skimmed, burned, and dispersed either subsea or on the sea surface. These corrections nearly double the total amount of oil as of May 17th. The total oil is then divided by the number of days to get an average rate. This method is not without its biases that might not be captured by formal uncertainty bounds as well. For example, all of the corrections made to the surface oil were to add in losses of oil to the system. To the extent that there are other unknown processes that remove oil naturally from the system that are unaccounted for, there may be "unknown unknowns" in this analysis as well. Therefore, further scientific investigation could push these estimates higher. For example, a correction was made for anthropogenic dispersion of oil subsea (assuming that none of it arrived at the surface), but current expeditions underway may determine that there is more oil in the subsurface than can be accounted for from surface and subsea dispersion. Note that while the plume team's analysis yields an "instantaneous" rate for flow of the well at that time that the video was taken, the calculation based on mass balance is an average rate for the first 27 days of the spill, assuming that the 5 days that sea-bottom dispersants were being applied did not contribute to the observable spill.

Reality Check: at least 11,000 barrels per day

To these independent estimates, a lower bound on the flow rate can be provided as a reality check by observing the behavior of the plume as a function of how much oil can be pulled up the RITT (Riser Insertion Tube Tool) from the leaking riser. On May 25, 2010, at approximately 1630 CDT, the RITT was yielding oil at the rate of 8000 barrels per day. The flow meter on the *Enterprise* vessel has been independently calibrated by a third party and thus this value is deemed reliable. We can revise that lower bound upwards by noting that a trickle of oil was still escaping out the end of the riser. If we assume that flow represents 15% of the original flow, then the lower bound on the flow rate rises to about 9000 barrels per day. At the same time, flow was moving through holes near the kink in the riser. It is difficult to estimate the proportion of oil versus gas escaping from the slits in the riser at this position. If the slits in the kink represent 1/6th of the flow, a lower threshold on the flow from observing changes in flow after insertion of the RITT is about 11,000 barrels per day of oil. Note that this lower bound alone is more than twice the earlier flux estimate of 5000 barrels per day. We consider this lower

bound close enough to the 12,000 barrels per day determined from the other two methods to be consistent with those lowest low bounds.

FRTG Members from the Federal Government appointed to date include:
Marcia McNutt, Director, USGS; William Rees, Jr., Los Alamos National Lab, Department of Energy; Darren Mollot, Department of Energy; Franklin Shaffer, Department of Energy; Victor Labson, USGS; Bill Lehr, National Oceanic and Atmospheric Administration; Austin Gould, US Coast Guard; Richard Brannon, US Coast Guard; Don Maclay, Minerals Management Service (MMS); Gerald Crawford, MMS; David Absher, MMS; and Bill Courtwright, MMS.

FRTG Members from academia and independent organizations appointed to date include:
Omer Savas, Professor of Mechanical Engineering, University of California Berkeley
James Riley, Professor of Mechanical Engineering, University of Washington
Juan Lasheras, Prof. of Engineering and Applied Sciences, University of California San Diego
Poojitha Yapa, Professor of Civil and Environmental Engineering, Clarkson University
Paul Boomer, Senior Lecturer, Petroleum and Geosystems, University of Texas at Austin
Steve Wereley, Associate Professor of Mechnical Engineering, Purdue University
Ira Leifer, Assoc. Researcher, Marine Science Institute, University of California Santa Barbara
Alberto Aliseda, Assistant Professor of Mechanical Engineering, University of Washington
Pedro Espina, National Institute of Standards and Technology.