FOR IMMEDIATE REVIEW - close hold - draft release on updated Plume Team estimates

Lee-Ashley, Matt to: McNutt, Marcia K, Hayes, David , Castle, Anne 06/08/2010 07:10 PM

Cc: "Rodriguez, Julie", "Barkoff, Kendra" , "Wainman, Barbara W", "Hines, Vic", "Nowakowski, Judy J", "Archuleta, Deanna", "Sogge, Mark K"

Hello everyone,

We have updated information from the Plume Team regarding flow rates from before the riser cut. We are working to get the information out as quickly as possible, and perhaps even tonight.

Can you please review the attached DRAFT statement from Marcia (06-08-2010 FRTG update)?

We would link to two other documents from that statement, which are also both attached.

Please keep these documents close hold and provide me your comments on the Dr. McNutt statement ASAP (within the next 30 minutes).

Marcia, I will alert you if we are able to make this announcement tonight so that you can tell the Plume Team scientists.

Thanks,

Matt 06-08-2010_FRTG update.doc Statement of the Plume Team.doc PoolingExperts-NIST2010Jun08.pdf

Flow Rate Technical Group's Continues Analysis of Data from BP Well

New Video and Data Allows One FRTG Team to Update Pre-Riser Cut Assessments

Washington, DC: USGS Director Dr. Marcia McNutt today provided an update on the work of the National Incident Command's Flow Rate Technical Group (FRTG), which is conducting ongoing analysis of the amount of oil flowing from BP's leaking oil well. Dr. McNutt announced that, in the coming days, the FRTG will have an updated estimate of flow rates from after the riser was cut.

"The work of the FRTG's scientists to develop accurate and scientifically grounded oil flow rate information is vital, both in regards to the continued response and recovery, as well as the important role this information may play in the final investigation of the failure of the blowout preventer and the resulting spill," said Dr. McNutt who is the chair of the FRTG, which was established by Admiral Thad Allen, the National Incident Commander. "The scientists participating in the FRTG have been working non-stop to analyze all the information that is available and refine the various methodologies being used."

On May 27, Dr. McNutt reported that the three teams within the FRTG had provided initial assessments of the oil that was flowing into the Gulf of Mexico. The Mass Balance Team, based an analysis of oil on the surface of the Gulf of Mexico from NASA's Airborne Visible InfraRed Imaging Spectrometer (AVIRIS), provided an initial flow range estimate of between 12,000 to 19,000 barrels of oil per day. The Plume Modeling Team, which analyzed video obtained from BP, provided an initial lower bound estimate of 12,000 to 25,000 barrels of oil per day, but at that point were continuing their work to provide an upper bound estimate. A third analysis of how much oil was being collected by the Riser Insertion Tube Tool (RITT) showed that the lower limit of oil flow was at least 11,000 barrels today. On May 27, the range of flow rates that was consistent with all of the methods considered by the FRTG was 12,000 to 19,000 barrels per day. Higher flow rates were consistent with the data considered by one of the teams.

Dr. McNutt today announced that one of the three teams within the FRTG – the Plume Modeling Team – has, based on additional video information and flow data, been able to update their estimates of how much oil was flowing before the riser was cut.

"From the beginning of this process, we have made clear that the FRTG and its teams would be updating their estimates as new data becomes available and making updated assessments available as quickly as possible," said McNutt. "The new estimate announced today by one of the FRTG teams, the Plume Modeling Team, is an example of this process. The Plume Modeling Team was initially only able to provide an estimate of the lower bound of the spill, but has since received new video data to analyze. Members of the Plume Modeling Team have therefore calculated updated lower and upper bound range estimates. Most of the experts have concluded that, given the limited data available and the small amount of time to process that data, the best estimate for the average flow rate for the leakage prior to the insertion of the RITT

is between 25,000 to 30,000 barrels per day. However, it is possible that the spillage could have been as little as 20,000 barrels per day or as large 40,000 barrels per day."

"It is important to remember that these assessments remain preliminary and are based on one methodology among several that the Flow Rate Technical Group is using," said McNutt. "We intend to provide, as soon as possible, an updated assessment of flow rates after the riser was cut that reflects multiple methodologies and the work of a broader grouping of scientists."

LINK

LINK

Statement of the Flow Rate Technical Group, Plume Team
June 8, 2010

On May 19, the NIC Interagency Solutions Group established the Flow Rate Technical Group that has as one of its subgroups the Plume Team represented in this report. Experts on fluid dynamics, subsurface well blowouts, petroleum engineering and oil spill behavior were assembled as part of a larger effort to improve spill size estimation. The team consists of both government scientists and leading scholars at academic institutions throughout the United States.

On May 27, the Team issued an Interim Report that established an estimated range for the minimum possible spillage rate but did not issue an estimate for a possible maximum value because the quality and length of the video data could not support a reliable calculation. Instead, they requested, and received, more extensive videos from British Petroleum (BP). Based upon analysis of these new videos, the group has reached the following conclusions, recognizing that these estimates are only to aid the Response, not to determine the final Federal calculation of spillage. Other applications of these results are not authorized and are not considered valid.

Because of time and other constraints, only a small segment of the leakage time was examined, and assumptions were made that may through later information or analysis be shown to be invalid. For example, the Team assumes that the average flow between the start of the incident and the insertion of the RITT was relatively constant and the time frames that were included in the examined videos were representative of the average. If this were not true, then the actual spillage may differ significantly from the values stated below.

Most of the experts have concluded that, given the limited data available and the small amount of time to process that data, the best estimate for the average flow rate for the leakage prior to the insertion of the RITT is between 2 to 30 thousand bbl/day. However, it is possible that the spillage could have been as little as 2,000 bbl/day or as large 40,000 bbl/day. Further analysis of the existing data and of other videos not yet viewed may allow a refinement of these numbers.

The team has not estimated the flow rate during the period of active measures to reduce leakage such as the period after the insertion of the RITT or during and immediately after Top Kill. It is expected that the flow rate increased with the severing of the riser above the BOP. However, the team is still examining the video of that flow and will produce an addendum, if appropriate, with an updated leakage estimate.

Each expert that contributed to this report reserves the right to alter his conclusions based upon further analysis or additional information

Pooling Expert Assessments

Antonio Possolo Pedro Espina

June 8th, 2010

1 Summary

In the course of the Plume Team te[le]co[n] of Mon[day], June 7th, six experts produced estimates of the average nu[m]ber o[f] ba[rrel]s of oil leaked per day from all sources of leaks that had b[een] evalua[ted]. Applying a statistical procedure to reconcile assessments mad[e] by m[ul]tiple e[x]perts produces an interval that, with 95 % confidence, shou[ld] includ[e] the true value of that average: this interval ranges from 15 to 40 thou[sand] barrels of oil per day.

2 Assess[m]ents

The following table s[u]marizes the intervals (in thousands of barrels of oil per day) that six experts provided during the telecon, that each expert believes should include the true value that is sought (please let us know if any of the names or numbers are incorrect, or whether additional names and numbers ought to be included — we can rerun the analysis very quickly, if need be):

	LOW	HIGH
Alberto	20	30
Ira	20	34
Jim	20	30
Juan	20	30
Omer	25	40
Steve	15	34

3 Approach

We use probability distributions to model the uncertainty implied in each expert's assessment, and then apply a statistical method to reconcile these distributions that is due to Lindley [1983]. The result is a probability distribution that represents the group's collective state of knowledge about the spill.

Obviously, not all views held by team members are yet represented. In particular, and for the reasons that Pooji articulated in his e-mail from yesterday at 9:40pm, we have not used his early assessment.

There also is an issue unresolved that Frank has brought up cogently: is the team estimating true average volume of oil spilled, or maximum volume? Listening to the discussion yesterday, it seems to us that all the experts but Frank are doing the former — that's why the preliminary results that Frank sent last evening are not included in the table above, or otherwise in this analysis.

4 Details

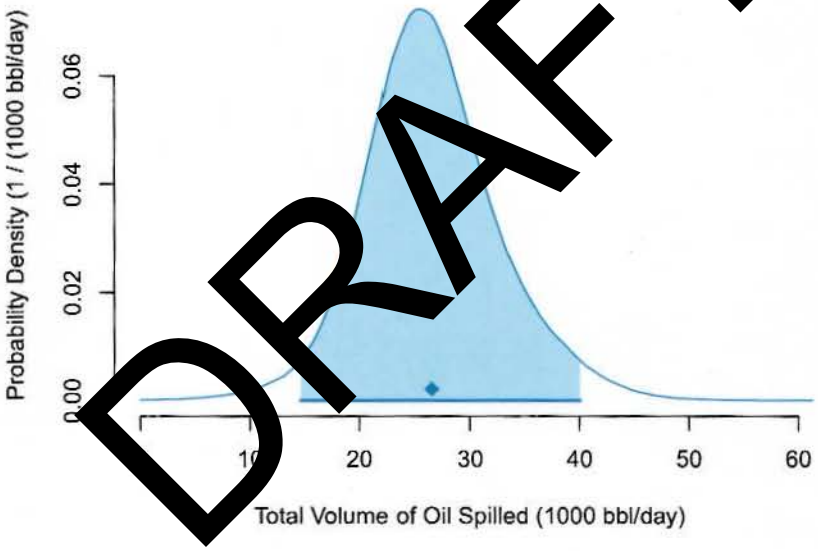
No one expressed quantitatively the level of confidence in the interval provided. Judging from the reaction our question prompted, when we asked if these might be more like 2σ confidence intervals or like 1σ intervals, or otherwise whether the experts were very confident in their results, it seems to us that we may fairly represent the sentiment of the majority by saying that these may represent assessments that the experts themselves consider *likely* to *very likely*.

According to the *Guidance Notes for Lead Authors of the IPCC Fourth Assessment Report on Addressing Uncertainties* that have been used by the Intergovernmental Panel on Climate Change in the preparation of their fourth assessment report [Solomon et al., 2007], *likely* is taken to mean confidence of at least 66 %, and *very likely* is taken to mean confidence of at least 90 %. We will use the geometric mean of these two values, and proceed on the tentative assumption that the intervals provided by the experts are like confidence intervals that cover their target with confidence level 77 %.

Further assuming that the confidence intervals purport to Gaussian situations, and using the confidence level just mentioned, we derived the means and standard deviations of the corresponding distributions: for example, for Juan's,

the implied mean is 25 000 bbl/day and the implied standard deviation is 4 159 bbl/day.

We produced a sample of size 500 000 by repeating the following steps this many times: select one expert uniformly at random; draw one value from the selected expert's distribution. The following figure is a smooth histogram of the results. The corresponding mean (dark blue diamond) is 26 500 bbl/day, and the standard deviation is 6 250 bbl/day. The shaded area comprises 95 % of the area under the curve: its projection onto the horizontal axis (thick, blue, horizontal line segment) is a 95 % confidence interval for the average total volume of oil spilled per day: it ranges from 15 000 bbl/day to 40 000 bbl/day.



References

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S. Solomon, D. Qin, M. Manning, M. Marquis, K. Averyt, M. M. B. Tignor, and H. L. Miller, editors. *Climate Change 2007 — The Physical Science Basis*. Cambridge University Press, New York, NY, 2007. Working Group I Contribution to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC).