Department of Energy
Carlsbad Field Office
P. O. Box 3090
Carlsbad, New Mexico 88221

JAN 14 2005

Mr. T. Herrell
Manager, Carlsbad Area Office
Bureau of Land Management
620 E. Greene St.
Carlsbad, NM 88220

Subject: Unrefined Petroleum Product in WIPP Well WIPP-25, Bureau of Land Management Right-of-Way #NM-108365

Dear Mr. Herrell:

On November 17, 2004, while performing water level measurements on monitoring well WIPP-25 (New Mexico Office of the State Engineer #C-2723, Bureau of Land Management Right-of-Way #NM-108365), Sandia National Laboratory (SNL) personnel noticed that their probe was coated with an oily substance having an odor of crude oil. This occurrence followed removal of approximately 13 thousand gallons of water from that well over a three day period in mid-September 2004 to determine the well's potential as a long term pumping test well. Water in WIPP-25 is pumped from the Culebra Member of the Rustler Formation at a depth of 447 to 472 feet below ground surface.

On December 6, 2004, SNL obtained a sample of the oily substance and submitted it to Florida State University for a finger print analysis. The laboratory report (attached) concludes that the substance is an unrefined petroleum product. Without comparative analysis of unrefined product typically produced in the region, the lab cannot declare the oil as "crude oil".

To DOE's knowledge, no actions taken by DOE or its contractors could have introduced an actual petroleum product into the well or its environs. The well contains non-potable water and its declared use, per the State Engineer permit, is for "exploration and monitoring". Water level measurements have been taken since installation of the well in 1978 and are vital to SNL's ongoing scientific studies of the Culebra.

It is WIPP's intent to continue monitoring this well. Please call if there are other stipulations that will apply to our current intended use of this well under these new circumstances.

Sincerely,

Dr. Inés Triay
Acting Manager

Enclosure

CBFO:OOD:HTP:KJB:05-0602:UFC5480

050111

cc:
S. Zappe, NMED
C. Lundstrum, AIP

CBFO:OOD:HTP:KJB:05-0602:UFC5480

Schaub, Edward F

Here are some example data from the first high resolution mass spectral analysis of the SNL sample. The complete analysis will consist of three parts - analysis of the nonpolar composition (shown here) and analysis of the polar composition in two modes of operation (positive and negative ion).
The results for the nonpolar analysis came out nicely. While this analysis yielded >2,000 unique molecular compositions, the polar analyses will yield at least five times that number. When we finish tomorrow, you will have the most complete description of your sample that is available with any single analytical technique.

The slides consist of:

Slide 1: Broadband mass spectrum of the nonpolar composition (the mass range actually extends beyond 800, and we have the higher mass data, but the bulk of the material is in this mass range). There are also two zoom insets in this figure that show the level of complexity that you are dealing with. The most "zoomed in" portion of this slide shows why you need our technique - the small mass spacings that are found in these complex mixtures are only resolved by FT-ICR mass spectrometry.

Slide 2: This is the important point: *from* the broadband mass spectrum in slide 1, we can *UNAMBIGUOUSLY assign* molecular formulae *from* the measured signals (other techniques cant do this). This is possible because we achieve extremely high mass measurement accuracy. The figure shows the relative abundance of different molecular "classes" that we observed in this sample.
Namely, we found molecules composed of carbon and hydrogen only, as well as hydrocarbons with 1-3 sulfur atoms, 1-2 nitrogen atoms, and hydrocarbons with one oxygen atom.

Slide 3: The main figure is called "type analysis" - for each class (slide 2), we can make these distributions that show how the relative abundance changes with molecular structure (i.e. the number of rings and double bonds in a given molecule). The inset shows an example carbon number distribution for the double bond equivalent = 4 type. Again, these can be made for each "type" (ring and double bond value) shown in the main figure on slide 3.

Slide 4: (This figure doesn't show up well on screen, but prints nicely.) The standard line of communication with our petroleum collaborators is by discussion of the class, type and carbon number distributions that I mentioned above. This slide shows a combination of type and carbon number distributions for observed molecules that only contain carbon and hydrogen (can be made for other classes as well). This type of data presentation is very useful for comparison of numerous samples and would be one of the tools we would use to compare this sample to another.

That's the jist of it - there's more, lots more, but that may give your people an idea of what we are doing. Basically, we are very good at comparitive analysis - so that if, in the future, we wanted to compare this sample to another oil sample we would be able to pick out any differences in a very detailed way. The quality of any "fingerprint" is determined by the number of parameters used to define it - in that sense, this is a very high quality fingerprint.

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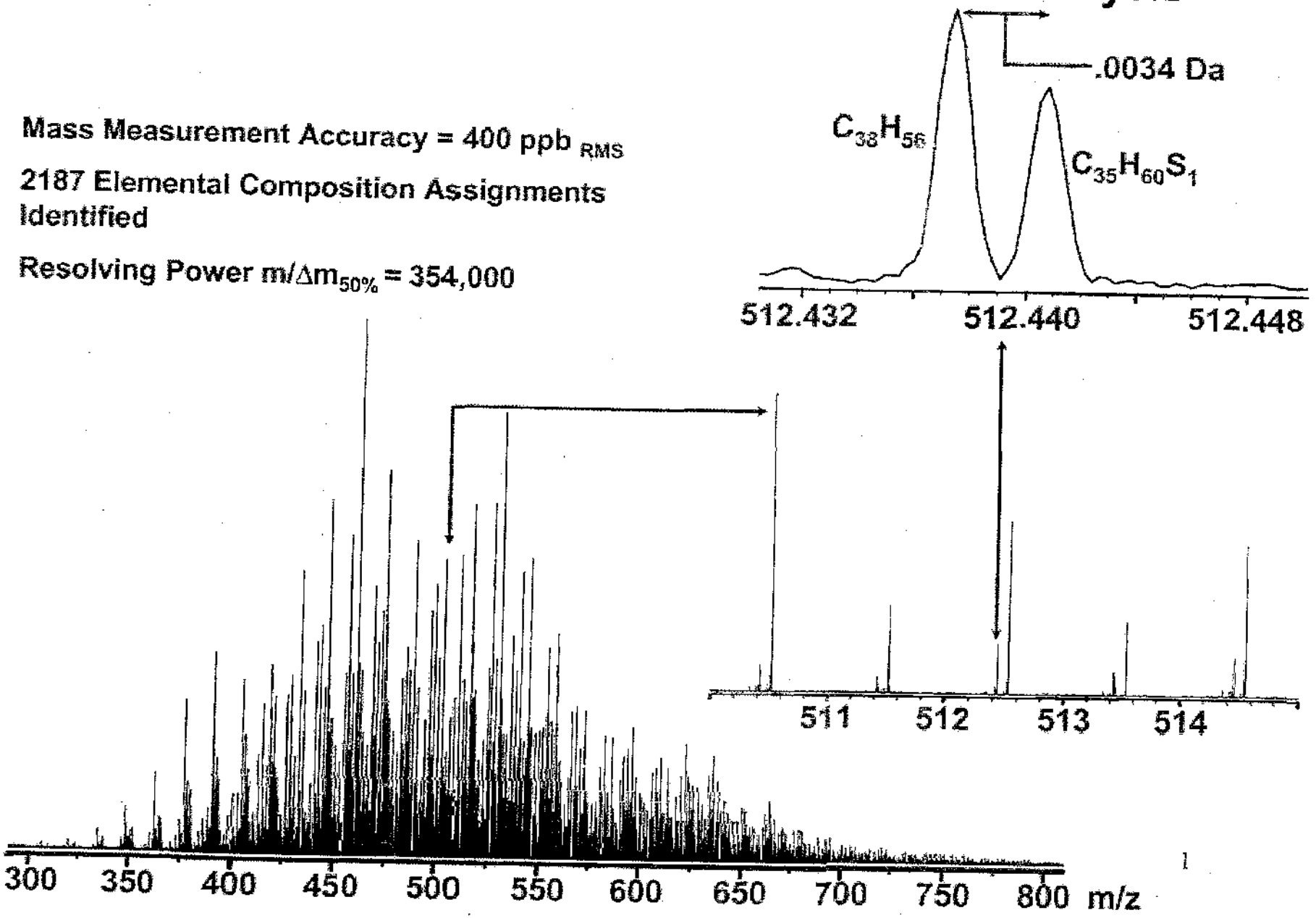
SNL Water Well Residue - FD FT-ICR Mass Analysis

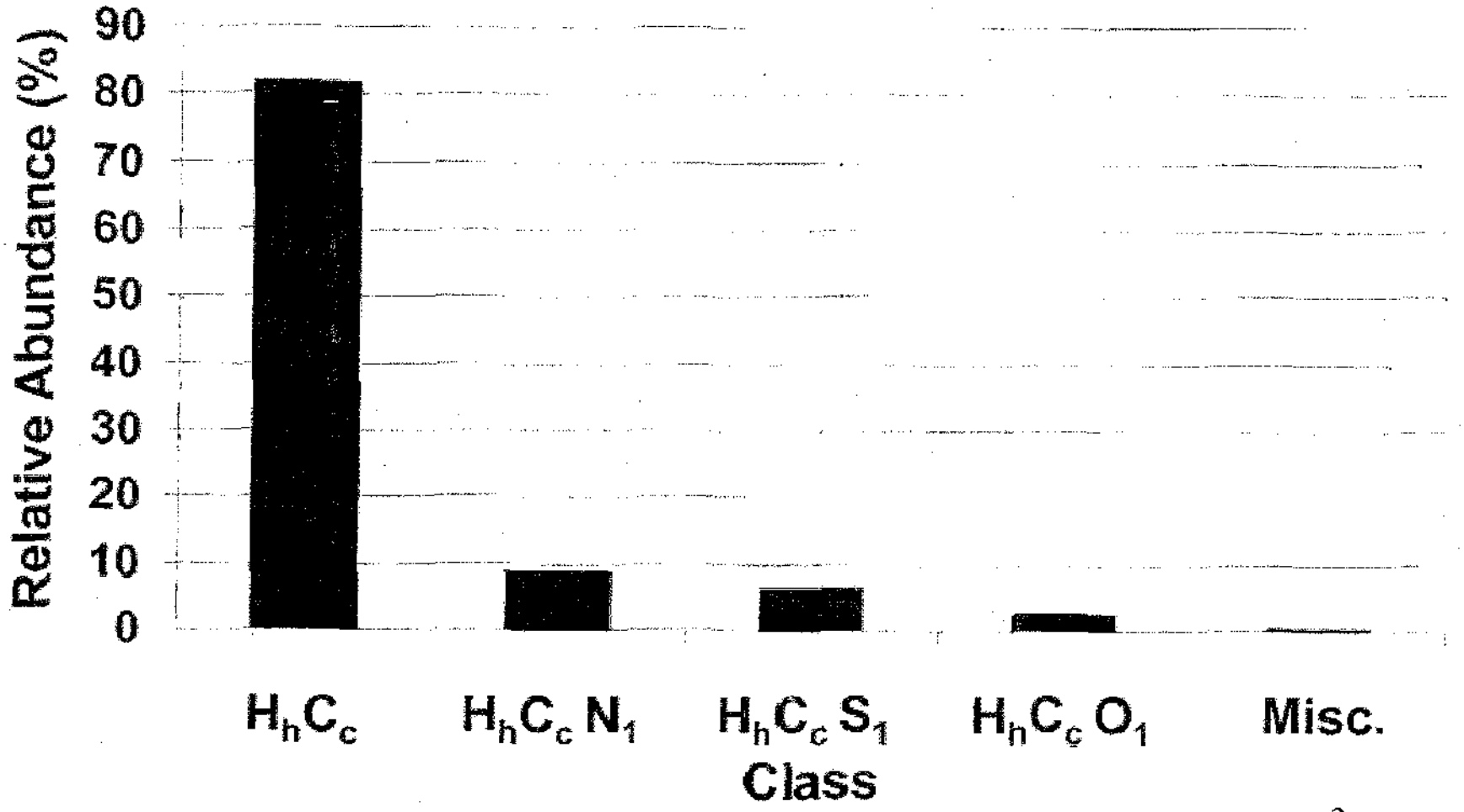
Mass Measurement Accuracy = 400 ppb $_{RMS}$

2187 Elemental Composition Assignments Identified

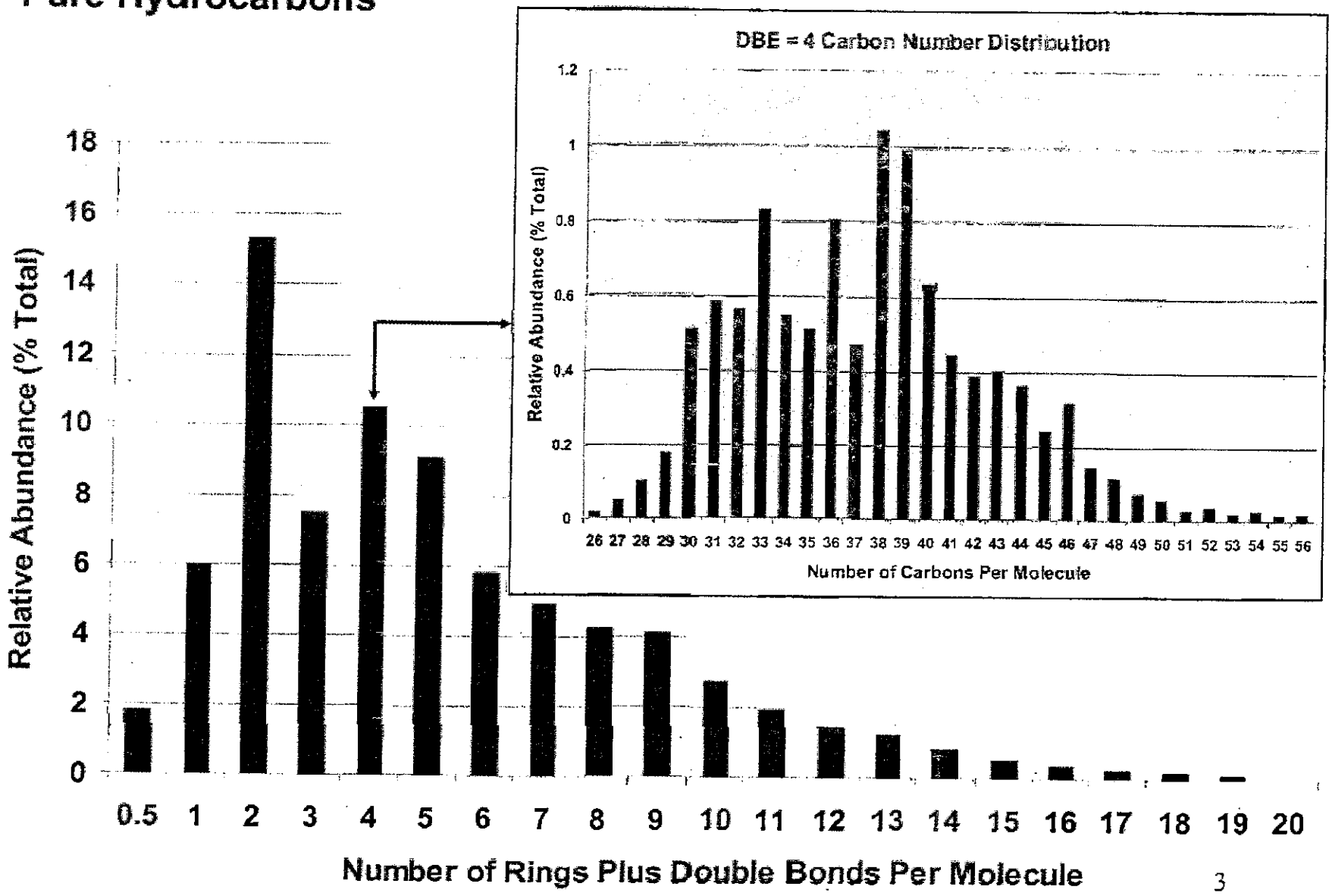
Resolving Power $m/\Delta m_{50\%}$ = 354,000



SNL Water Well Oil Residue - FD FT-ICR MS Class Analysis



SNL Residue – Example Type and Carbon Number Distributions for Pure Hydrocarbons



SNL Water Well Oil Residue - FD FT-ICR MS
Hydrocarbons