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August 24, 1992

Analysis of Hydrocarbon Sample From Well on Berkeley Land Company Property in Hayward, California

Mr. Tim Belaney
Berkeley Farms
1121 Newell Avenue Suite 120
Walnut Creek, CA 94591

Dear Mr. Belaney:

You asked us to analyze a hydrocarbon sample collected on July 8 from a monitoring well on property owned by Berkeley Land Company in Hayward.

Gas chromatography showed the hydrocarbon to be a distillate with a distribution of molecular sizes from carbon number 10 to 24 (C_{10} to C_{24}). (Please see the enclosed chromatogram.) The distribution reached its maximum at C_{15}. This is the typical distribution and maximum for Diesel Fuel No. 2. The absence of lower carbon number species indicates the sample does not contain gasoline.

Diesel fuel is a complex mixture of hydrocarbons of different sizes and types. Since many of the hydrocarbons have very similar boiling points, gas chromatography can not resolve each one into a separate peak. The chromatograph consists of a broad continuum of unresolved peaks from which a number of resolved peaks emerge (like pins on a pin cushion). The only hydrocarbons we can associate with the resolved peaks is the series of "normal" (linear or straight chain) paraffins. I have identified these by the symbol C^n_x, where "x" is the carbon number.

I have also constructed the normal paraffin distribution curve by drawing a dotted line through the maxima of the normal hydrocarbon peaks. This distribution has the regular shape one would expect to result from a distillation process. There is no noticeable deficiency in either the smallest or largest normal paraffins.

The presence of the smallest molecules suggests that the sample has not undergone extensive evaporation. The sample's flash point of 226°F[1] supports this conclusion.

[1] Pensky-Martens Closed Tester; ASTM D 93

It is higher than the national average of 142°F[1], but within the normal range (near the top) for product from Chevron's Richmond Refinery. The sample probably did not spend much time on the surface of the ground.

The presence of the largest normal paraffins suggests that the sample has not been in the biological environment very long--perhaps weeks, rather than months. Biodegradation begins with the largest normal paraffins and works down to the lower ones. Since biodegradation depends on many factors, we can not date the sample exactly.

The sample has one distinctive chromatographic feature: the peak with a retention time slightly greater than that of the C^n_{17} peak. It is disproportionally higher than the other non-normal paraffin peaks.

I reported these results to you orally on July 29.

Details

Sample Origin

You told me the sample came from a monitoring well on the Berkeley Land property shown in the enclosed map. The map shows the property is located on Middle Lane near the intersection of Middle Lane and Saklan Street. The monitoring well was not originally designated on the map. You drew a circle locating it West of the "Shed" and North of the "Tank Excavation".

Sample Identification And Custody

You gave me the sample on July 27. It was in a one-quart amber glass bottle. The bottle was almost full. The bottle already bore the label of "BC Analytical - Emeryville" and their ID Number: 07-163-6. I assigned my ID Number, MFTW 1992.353A, and delivered it to Mr. Jerry Kimberlin of CRTC's Analytical Sciences Unit, who assigned it their Project Number 5216. Ms. N. Berkowiz used gas chromatography with a flame ionization detector to determine a qualitative carbon number distribution. The sample was then returned to me.

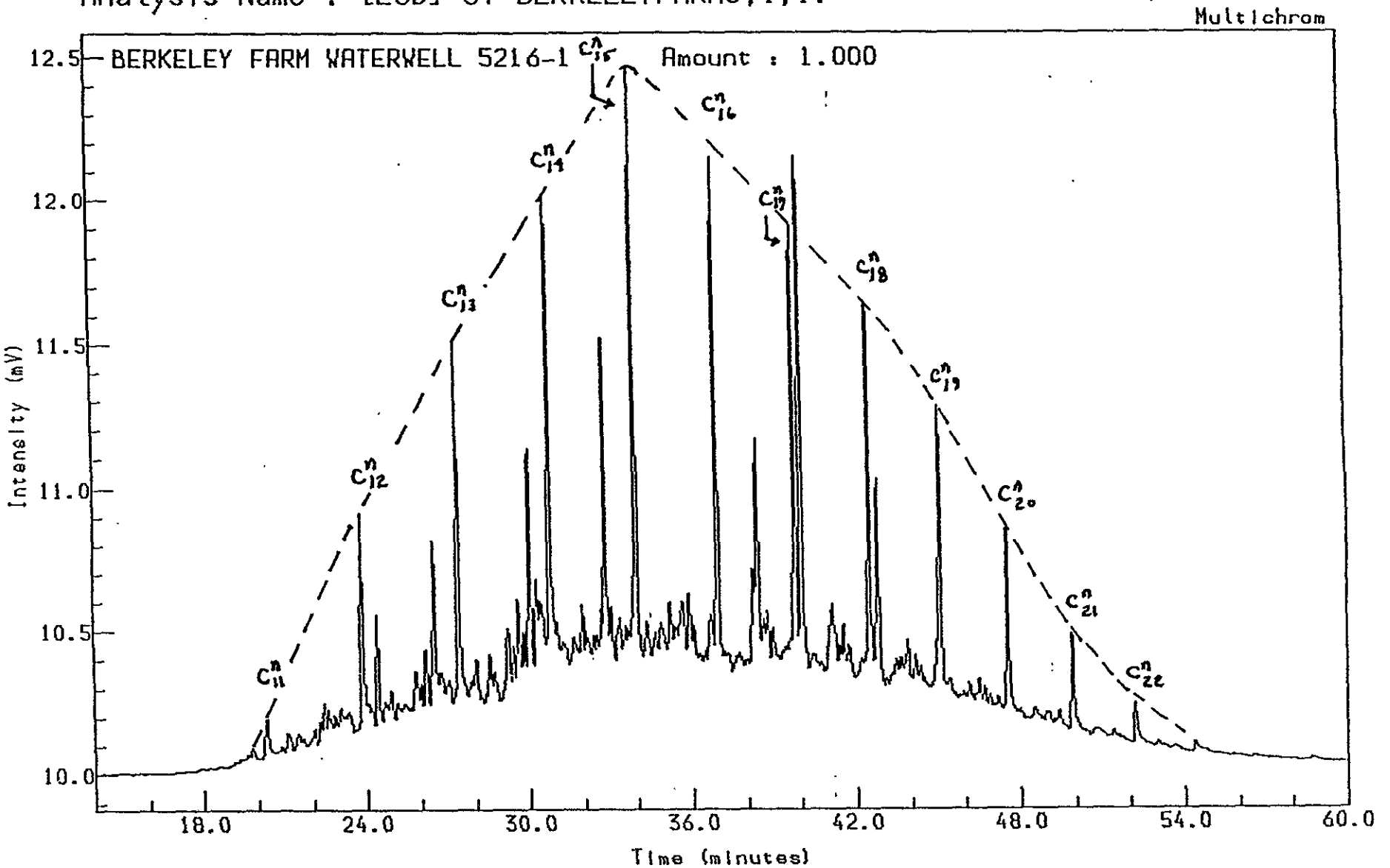
Very truly yours,

David Lesnini

Enclosures - Gas Chromatograph
- Map

[1] National Diesel Fuel Survey; Summer 1991; Motor Vehicle Manufacturers Association

Analysis Name : [ECD] 37 BERKELEYFARMS,1,1.



Acquired on 29-JUL-1992 at 09:46 Reported on 10-AUG-1992 at 14:12

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