N00639.AR.002062
NSA MID SOUTH
5090.3a

LETTER TRANSMITTING SUMMARY OF THE RESULTS OF THE TRITIUM ANALYSIS
MILLINGTON SUPPACT TN
3/7/1995
U S DEPARTMENT OF THE INTERIOR

# United States Department of the Interior

U.S. GEOLOGICAL SURVEY

Water Resources Division
810 Broadway, Suite 500
Nashville, Tennessee 37203


March 7, 1995

Commanding Officer
Naval Air Station-Memphis
Mrs. Tonya Barker, Director
Public Works, Environmental Division
Code 01010
Building S-241
Millington, Tennessee 38054

Dear Tonya,

Attached is a brief summary of the results of the tritium analyses recently performed on two samples of water collected by the U.S. Geological Survey from the fluvial deposits aquifer adjacent to the two Memphis aquifer production wells at the NAS Memphis. Results indicate that the fluvial deposits aquifer contains recent (post-1952) water. Please note that the table of tritium results included as the last page of the enclosure shows that a rerun of one of the samples is in progress. I have talked with the laboratory and they have assured me that, although they do not expect the reported value to change significantly, they are rerunning the sample to provide verification of the reported concentration. The results should be available in about two weeks and I will inform you of any significant changes. Thus, pending some unanticipated results from the rerun, these data, combined with the previous analyses showing the absence of tritium in the Memphis aquifer, indicate that leakage from the shallow aquifer into the Memphis aquifer is not occurring in the area near the production wells. If you have any questions about the results of the analysis, please contact me at (615) 736-5424, ext. 3137.

Sincerely,

John K. Carmichael
Hydrologist

Enclosures
cc: Mr. M. Taylor

# RESULTS OF TRITIUM ANALYSIS OF GROUND-WATER SAMPLES FROM THE FLUVIAL DEPOSITS AQUIFER AT THE NAVAL AIR STATION MEMPHIS

As part of the RCRA Corrective Action Program being conducted at the Naval Air Station (NAS) Memphis, near Millington, Tennessee, the U.S. Geological Survey (USGS), collected two samples of ground water from the fluvial deposits aquifer for tritium analysis. These samples were collected with the Hydrocone tool during the Direct Push Technology phase of the RCRA Facility Investigations at Assembly A SWMUs, at locations adjacent to the two Memphis aquifer production wells previously sampled for tritium analysis. The samples were analyzed at a laboratory at the University of Miami under an agreement with the USGS. Samples were collected from the fluvial deposits aquifer to confirm the presence of tritium in the aquifer for validation of interpretations made about the Memphis aquifer samples.

Tritium is a naturally occurring radioisotope of hydrogen and is used in hydrogeologic studies to determine the relative age of ground water. Atmospheric testing of thermonuclear weapons between 1952 and 1963 increased tritium concentrations in precipitation by several orders of magnitude over naturally occurring levels. The presence of tritium in ground water generally indicates recent (post-1952) recharge from precipitation to a ground-water system. The USGS has used tritium analyses to aid in identifying locations in the Memphis area where downward leakage of water from shallower zones (the fluvial deposits or alluvial aquifers) into the Memphis aquifer is occurring. At the NAS Memphis, samples analyzed for tritium from the two production wells indicate that no post-1952 water is present in the Memphis aquifer in the area near these wells. However, corresponding data were not available to confirm the presence of tritium in the fluvial deposits aquifer in the NAS Memphis area.

Samples collected from the fluvial deposits aquifer had tritium concentrations of about 12 and 15 TU (tritium units), indicating a component of post-1952 recharge to the aquifer. These data and the data showing no tritium in the Memphis aquifer indicate that the confining unit in this area is an effective barrier to the interchange of water (and potential contaminants) between the Memphis aquifer and the shallower fluvial deposits aquifer. Additional comments on tritium methods and general results, as well as the specific results reported for these samples are attached.

UNIVERSITY OF Miami

February 15, 1995

TRITIUM LABORATORY

Data Release #95-18
Job # 688

U.S. GEOLOGICAL SURYVEY, WRD
TRITIUM SAMPLES

Purchase Order No. 048353
Requisition No. 5-4547-2122

H. Göte Ostlund
Head, Tritium Laboratory

Distribution:
James Kingsbury
U.S. Geological Survey
Agricenter International
7777 Walnut Grove Rd., Box 21
Memphis, TN 38120

Rosenstiel School of Marine and Atmospheric Science
Tritium Laboratory
4600 Rickenbacker Causeway
Miami, Florida 33149-1098
(305) 361-4100
Fax (305) 361-4112

Revised January 1, 1994

# GENERAL COMMENTS ON TRITIUM RESULTS

## Tritium Scale (New)

The tritium concentrations are expressed in TU, where 1 TU indicates a T/H ratio of $10^{-18}$. The values refer to the new tritium scale of U.S. National Institute of Science and Technology (formerly Bureau of Standards), which is based on their tritium water standard #4926 as measured on 1961/09/03 and again 1978/09/03, and age-corrected with the new half-life of 12.43 years, i.e., $\lambda$ = 5.576% $year^{-1}$. In this scale, 1 TU is 7.088 dpm/kg $H_2O$, or 3.193 pCi/kg $H_2O$, or 0.1181 Bq/kg $H_2O$ (Bq = disint/sec). TU values are calculated for date of sample collection, REFDATE in the table, as provided by the submitter. If no such date is available, date of sample arrival at our laboratory is used. The stated errors, eTU, are one standard deviation (1 sigma) including all conceivable contributions.

In the table, QUANT is quantity of sample received, and ELYS is the amount of water taken for electrolytic enrichment. DIR means direct run (no enrichment).

Through 31 December 1993, we reported tritium values in the "old" scale using the half-life 12.26 years, i.e., $\lambda$ = 5.65% $year^{-1}$. In that old scale, 1 TU(old) is 7.186 dpm/kg $H_2O$, 3.237 pCi/kg $H_2O$. To convert from the new scale back to the old at any given point in time, multiply the listed TU(new)-values by F, where

$$F = 0.9645 - (year-1990) \times 0.0008$$

i.e. for 1994 the factor is 0.9613. The formula is correct within 0.02% between 1962 and 1999. To convert data from the old scale to the new, divide by F.

## Very low tritium values

In some cases, negative TU values are listed. Such numbers can occur because the net tritium count rate is, in principle the difference between the count rate of the sample and that of a tritium-free sample (background count or blank sample). Given a set of "unknown" samples with no tritium, the distribution of net results should become symmetrical around 0 TU. The negative values are reported as such for the benefit of allowing the user unbiased statistical treatment of sets of the data. For other applications, 0 TU should be used.

## Reliability of results

Refer to Services Rendered (Tritium), Section II.8, in the Tritium Laboratory Price Schedule, Procedures and Standards, Advice on Sampling.

## References

Mann, W.B., M.P. Unterweger, and B.M. Coursey, Comments on the NBS tritiated-water standards and their use, *Int. J. Appl. Radiat. Isot.*, 33, 383-386, 1982.

Taylor, C.B., and W. Roether, A uniform scale for reporting low-level tritium measurements in water, *Int. J. Appl. Radiat. Isot.*, *33*, 377-382, 1982.

Client: USGS - TENNESSEE
Recvd : 95/01/18
Job# : 688
Final : 95/02/14

Purchase Order:
Contact: J. Kingsbury 901/766-2977
Agricenter Internat., 7777 Walnut Grove Rd., Box 21, Memphis, TN 38120

| Cust | LABEL INFO | JOB.SX | REFDATE | QUANT | ELYS | TU | eTU |
|---|---|---|---|---|---|---|---|
| USGS-TN | NASM SWMV #7 | 688.01 | 941210 | 1000 | 243 | 15.7 | 0.5 |
| USGS-TN | 7GH23 | 688.02 | 941210 | 1000 | 275 r | 12.4 | 0.4 |

r: RERUN in progress