93-188 21

Wisconsin Manufacturers & Commerce

August 1, 1997

Mr. Steve Karklins
Bureau of Drinking Water and Groundwater
Wisconsin Department of Natural Resources
PO Box 7921
Madison WI 53707-7921

Dear Mr Karklins: Steve

I am writing this letter to provide comments on the Department of Natural Resources proposed changes to the groundwater standards contained in NR 140, on behalf of Wisconsin Manufacturers & Commerce (WMC). WMC is a business association with approximately 4600 members that employ about 500,000 people in this state. Many of our members are directly or indirectly affected by the NR 140 standards. We have a number of concerns which are set forth below.

I. Boron, Benzo[b]fluoranthene, Chrysene, Acenaphthylene, and Trimethylbenzenes.

WMC supports the comments regarding boron submitted to the Department, which are contained in the July 23, 1997 letter written by Dr. Michael G. McMurtry (STS Consultants, Ltd.) to Mr. Nicholas C. George, Jr. (Wisconsin Utilities Association), and hereby incorporates those comments by reference. As mentioned in the July 23, 1997 letter, we question whether the proposed enforcement standard for boron is appropriate for the following reasons.

- The proposed standard incorporates a default assumption that 80 percent of the total "safe" intake of boron will be from non-drinking water sources such as diet.
- The proposed standard appears to be based on an obsolete study that is outdated, and failed to consider the most current scientific information available regarding boron's nutritional requirements and toxic thresholds
- The proposed standard did not consider critical information which would support the use of more reasonable uncertainty factors when extrapolating effect levels from animals to humans.

WMC also supports the Utilities Association's comments regarding benzo[b]fluoranthene, chrysene, acenaphthylene, and trimethylbenzenes.

II Radioactive Substances (Beta particle and photon radioactivity, Gross alpha particle radioactivity, radium-226 and radium-228 combined)

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The proposed standards for these radioactive substances are based upon maximum contaminant levels established by the Environmental Protection Agency (EPA) in the 1970s. Since that time, the EPA has proposed modifications to those numbers, which were significantly higher than the numbers proposed by the Department

The MCLs have been in existence for approximately 20 years. Given the apparent lack of urgency in adopting these as state standards, and given the fact that these numbers have been the subject of review at the federal level, the Department should not go forward with these standards at the current time

III. Ammonia

WMC is concerned that the proposed ammonia standard is not based upon scientifically valid information. Apparently, this view was also shared by Dr. Jay M. Goldring, former Research Scientist II with the Department of Health and Social Services, Division of Health. Dr. Goldring was one of the authors of the "Recommended Groundwater, Enforcement Standards and Preventative Action Limits, Cycle 7, Summary of Scientific Support Documentation for NR 140.10, October 1996." (Summary Document)

Attached is an October 23, 1995 memorandum from Dr Goldring to Mike Lemcke, (DNR, Bureau of Water Resources) regarding Cycle 7 Groundwater Standards. In that memorandum, Dr. Goldring states: "Please note that DHSS did not propose a health-based standard for ammonia nitrogen due to lack of scientific information concerning its toxicity." Rather, Dr. Goldring recommended the Department propose a public welfare standard, with the enforcement standard at 29 ppm, at the Preventive Action Limit at 14 ppm.

We question what information has changed since Dr. Goldring opined that there was a lack of scientific information regarding this matter. It appears from the Summary Document that the newest toxicity study used regarding ammonia was from 1982, years before Dr. Goldring's statement. Given this apparent lack of information, WMC strongly opposes the proposed standard

Thank you for the opportunity to comment Furthermore, if you have any questions, please contact me.

Sincerely,

Patrick K Stevens
Environmental Policy Director

PKS:sjc

CORRESPONDENCE/MEMORANDUM

Wisconsin Bureau of Public Health

DATE: October 23, 1995

TO: Mike Lemcke, Department of Natural Resources
Bureau of Water Resources

FROM: Jay Goldring, Ph.D., Toxicologist
Section of Environmental Epidemiology and Prevention
608/266-7480

SUBJECT: Cycle 7 Groundwater Standards: First Draft

Attached are the first drafts of the scientific support documentation for the remaining 12 Cycle 7 Groundwater Standards. Please combine them with the drafts sent to you approximately one month ago by Lynda Knobeloch.

Please note that DHSS did not propose a health-based standard for ammonia nitrogen due to the lack of scientific information concerning its toxicity. Instead, we recommend that your staff propose a public welfare standard at the specified level. Also note that the document for the alachlor metabolite is not included pending further discussions between your staff and ours.

Draft standards for the compounds included in this document are summarized below:

Health-Based Standards

Compound	Enforcement Standard (ppb)	Preventive Action Limit (ppb)
Anthracene	3	0.6
Carbon Disulfide	1000	200
Dibutyl Phthalate	100	20
Fluoranthene	400	100
Methanol	5000	1000
N-nitrosodiphenylamine	7	0.7
Prometon	150	30
Pyrene	250	50
Pyridine	10	2
1,2,3-Trichloropropane	60	12
Vanadium	30	6

Public Welfare Standards

Compound	Enforcement Standard (ppm)	Preventive Action Limit (ppm)
Ammonia Nitrogen	28	14

Please contact me if you have any questions.

cc: Henry Anderson

as they Apply to Very Low Intakes of Radium

This document was prepared by Dr. Robert E. Rowland. Dr. Rowland holds a Ph.D in Radiation Biology, and has spent most of his professional career at the Argonne National Laboratory studying and publishing scientific papers on various aspects of the toxicity of radium in humans. He joined the Laboratory in 1950, became Associate Director of his research division in 1964, Director in 1967, and was appointed Associate Laboratory Director for Biology and Medicine of the Argonne National Laboratory in 1981. He retired in 1983, and has worked as a consultant to the Laboratory and other organizations since that time. He has recently written a book on the history of the use of radium in the United States which summarizes the current knowledge of the toxicity of this radioelement in humans[1]. He was a member of the National Council on Radiation Protection and Measurements (NCRP) from 1971 until his resignation in 1983.

In 1969 the Atomic Energy Commission combined all of its funded research studies on radium in humans into one program, the Center for Human Radiobiology, and placed that program at Argonne under the direction of Dr. Rowland. The files in the Center for Human Radiobiology at the Argonne National Laboratory contain the names of approximately 6000 people who acquired the element radium internally. Many of these people acquired radium when internal radium was prescribed by members of the medical profession, a practice popular in the 1920s and early 1930s. Others acquired radium as a consequence of buying and drinking water to which high levels of radium had been added. The greatest number, however, acquired radium when they worked in the watch-dial industry, where a radium-containing paint was applied to watch and clock dials so that the hands and numerals would glow in the dark.

More than 2400 of these radium-containing individuals have been carefully studied in the laboratory, both for their radium content and their health status. The ultimate cause of death has been determined for the deceased cases by autopsy or at least by means of a death certificate. (More than 1000 of the these studied individuals were still living in 1990, even though most received their radium between 1920 and 1950.)

It should be recognized that all humans carry radium in their body, as a consequence of the radium ingested daily from food and water. The amount in any given person varies, depending upon their diet, but is usually of the order of 30 to 40 pCi. Similarly, radon is present in the air we breathe every day. Radon is a gas formed when radium atoms decay; its source is the radium everywhere in the soil. It is at far greater concentrations in the air than in the body from our deposited radium.

The lowest level of radium that can be measured in the body by whole-body counters is about 4000 pCi or 4 nCi. This limit is the consequence of a much more abundant form of natural radioactivity in man, that from potassium. Potassium, a normal and necessary component of the human body, contains a

117,000 pCi, or 0.12 μCi. The decay of ^{40}K contributes so many gamma rays that body-counters are flooded with these counts, limiting their sensitivity to radium.

Exposure to radiation is feared because of the well-known ability of high levels of radiation to cause malignancies. What is seldom recognized is the fact that all humans are exposed to low levels of natural radiation at all times. The difference between the "high" and the "low" may be a factor of a million or so. It is known that two distinct malignancies can be induced by very high levels of radium in the body, bone sarcomas and carcinomas originating in the mastoid air cells or paranasal sinuses. These latter malignancies have been called "head carcinomas" for brevity. Dose response relationships have been derived and published [2,3,4] for each of these malignancies. No other malignancies have been proven to be induced by radium in the human body. A number of studies have examined all the other malignancies observed in the studies of radium in humans, but no other malignancies have been found to be consistently and statistically elevated.[5,6,7]

In 1975 the Environmental Protection Agency (EPA) proposed interim standards for radium in drinking water, and in 1976 published the National Primary Drinking Water Regulations, containing Maximum Contaminant Levels (MCLs) for radium. These MCLs were set at 5 pCi per liter for the sum of the ^{226}Ra plus ^{228}Ra activity in the water. These levels are still with us today, but much new information has been developed in the meantime which makes these standards unnecessarily stringent.

As a consequence of the large study of the toxicity of radium in humans, radium standards may now be based on human experience with radium, not derived from laboratory animal studies. Further, there is no need to attempt to deduce the effects of radium deposited within the human body from the experience of those exposed to the whole body gamma and neutron irradiations from atomic bomb detonations. Thus there is no need to introduce modifying factors in an attempt to translate animal results into predictions of human effects, or to attempt to predicted the effects of radium deposited in bone from estimates of bone dose from whole body irradiations. This is very important, for from animal studies it has been observed that radium is absorbed, retained, and eliminated quite differently in various species, and that in no species does radium adequately mimic the observed behavior in humans. Likewise, many more radium-induced bone sarcomas have been observed in our radium studies than radiation-induced bone malignancies were observed among the atomic bomb survivors.

In the Federal Register for July 18, 1991[8] MCLs for drinking water of 20 pCi for both ^{226}Ra and ^{228}Ra were proposed. The risk of drinking water containing these levels of radium can be calculated by reference to actual human experience, without reference to any hypothesis or arbitrary standard. It can be done as follows:

take the EPA recommendation level of consumption, 2 liters of water per day at the proposed MCL for ^{226}Ra, 20 pCi per liter, times 365 days per year multiplied by 50 years. Of this total oral intake 20% will be absorbed into the systemic circulation[3] and circulated throughout the body. The calculation thus yields:

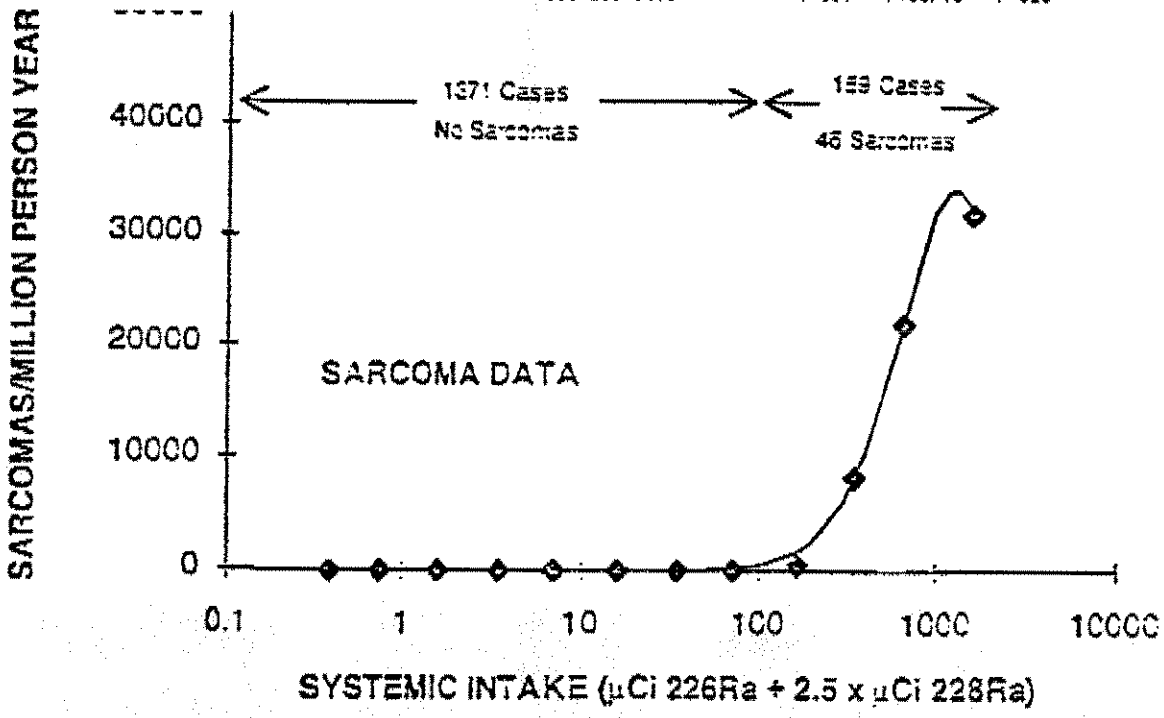
$$(20\ pCi/l \times 2\ l/d \times 365\ d/y \times 50\ y) \times 20\ \% = 146{,}000\ pCi$$

Thus after 50 years the total intake will be of the order of 150,000 pCi or 0.15 µCi of radium, or 0.3 µCi if both radium isotopes were present at the proposed maximum level.

A recent study[4] of the risk from internally deposited radium demonstrated that the probability of a radium-induced malignancy was very low in those cases where the total radium that had entered the systemic circulation was less than 75 µCi. Indeed, more than 2400 individuals exposed to radium from all sources have had their body contents measured and their radium intakes calculated[1], and not one radium-malignancy has been observed in any case with a total radium intake of less than 75 µCi. Thus at the maximum proposed radium concentration in drinking water, ingested continually for 50 years, at an ingestion rate (two liters per day) that is seldom achieved, with no other source of liquids (milk, bottled soft drinks, beer, etc.), one would accumulate less than 0.5 % of the lowest intake associated with a malignancy.

It has been observed that malignancies are induced at lower levels than any other symptom associated with high radium intakes. Such symptoms, such as bone necrosis or spontaneous fractures, are not seen until intakes levels of more than 100 µCi are achieved. Above such levels there is a high risk of a malignancy or other damaging symptoms of radium poisoning. Thus no effects from radium deposited within the body can be expected at the levels that would be obtained by drinking water containing the radium isotopes at the proposed MCLs.

The following graph of the observed bone sarcomas in a population of female dial workers who started work in the radium dial industry before 1950[4] shows the abrupt rise in the occurrence of bone sarcomas as the systemic intake approaches 100 µCi.



There were 1530 female dial workers in this study who experienced 46 bone sarcomas. It is the best group for analysis, for we have a single sex, similar occupation, identical route of entry of radium into the body (oral), and nearly all of the same age, 20.4 ± 2.1 years. Were we to take all the measured radium cases, there would now be 2403 cases with 64 bone sarcomas, but the plot of incidence against dose would look exactly the same, for there were no bone sarcomas observed below 100 μCi. The only difference would be the number of cases below the lowest level malignancy observed; that number is greater than 2100 for the population of all measured cases.

Radium is also known to induce another type of malignancy, which have been called head carcinomas. They are not as abundant as the bone sarcomas. Only 19 were observed among the 1530 radium dial workers vs. 46 bone sarcomas, while the total radium exposed population of 2403 measured cases experienced 32 vs. 64 bone sarcomas. None appeared at intake levels less than 75 μCi.

It should be noted, however, that some studies have concluded that other cancers are induced by radium at very low levels such as occur in natural drinking water. Lyman and co-workers[10] have published on an association between groundwater radium levels and the incidence of leukemia in certain Florida counties. These counties have substantial deposits of phosphate, which contain ^{238}U, the source of ^{226}Ra. This radium may ultimately enter the groundwater. Similarly, Bean and co-workers[11,12] have published associations between groundwater radium in Iowa and certain malignancies, and while no increase in leukemia was found, other malignancies were elevated, specifically bladder, lung, and breast cancer, malignancies not mentioned in the Lyman

these malignancies were indeed caused by ingested radium, surely they would be expected to be observed in the much larger study of radium cases, many with much higher intakes of radium.

All of these studies have been reviewed and discussed in a document written by a committee of the National Research Council, Health Risks of Radon and Other Internally Deposited Alpha-Emitters, also know as BEIR IV.[13] On page 228 of the BEIR IV document the following statements are found:

> "Lyman et al. show a significant association between leukemia incidence and the extent of groundwater contamination with radium. The majority of the leukemias were acute myeloid leukemias. Further, a dose-response relationship is suggested for total leukemia with increasing levels of radium contamination.
>
> "Lyman et al. do not claim, however, to have shown a causal relationship between leukemia incidence and radium contamination. They point out that there is no information on individual exposure to radium from drinking water, nor to other confounding factors. Since leukemia rates are not elevated in the radium-dial worker studies, where the radium exposures ranged from near zero to many orders of magnitude greater than could be attributed to drinking water, it is difficult to understand how radium accounts for the observations in this Florida study."

The point is that there was no indication of how many of the cases with leukemia were actually drinking water containing radium, or if they were drinking water with elevated radium how long they might have consumed it.

The reader should note that radium is often found in water from deep wells; surface water usually contains very little radium, and that home water softening processes effectively remove radium from water. These comments are relevant to the next quotation from page 231 of the BEIR IV document, where the following statements are found:

> "A pair of studies relating cancer to source of drinking water in Iowa were reported by Bean and co-workers. The first of these examined the source of water, the depth of the well, and the size of the community. This study was aimed at the role, if any, of trihalomethanes resulting from the disinfection of water by chlorination. The second, which used the deep-well data from the prior study, examined cancer incidence as a function of radium content of the water. Twenty-eight towns met the three criteria for the second study: a population between 1,000 and 10,000, water is obtained solely from wells greater than 500 ft (152 m) deep, and no water softening. These 28 towns had a total population of 63,689 people in 1970.

annual age-adjusted incidence rates were examined for the period 1969-1978 (except for 1972), certain cancers were found to increase with increasing radium content. These were bladder and lung cancer for males and breast and lung cancer for females. Their data, plus the incidence rates for these cancers for all Iowa towns with populations 1,000 to 10,000 are shown in Table 4-6.

TABLE 4-6 Cancer Incidence Rate among Persons Exposed to Different Concentrations of Radium in Drinking Water

	Age-Adjusted Incidence Rate/1,000,000				
	pCi/Liter			Water Supply from:	
Cancer Site	0-1	2-5	5	Surface[a]	Ground[b]
Male lung	64.9	85.6	102.3	80.3	78.2
Female lung	13.2	15.7	19.2	19.9	15.6
Male bladder	24.5	27.6	33.7	29.9	25.3
Female breast	75.3	89.4	121.5	101.5	95.6

[a]All towns, 1,000 to 10,000 population, with surface water supplies.

[b]All towns, 1,000 to 10,000 population, with groundwater supplies.

When examined in this fashion, questions arise. There is no doubt that male and female lung cancers appear to increase with an increase in the radium content of the water, but in the case of the female lung cancers the levels were never as great as observed for those who drank surface water. A similar situation exists for female breast cancer. For male bladder cancer only, the highest radium level produced a higher cancer rate than was observed for those consuming surface water. Were it not for the fact that these cancers were not seen at radium intakes hundreds to thousands of times greater in the radium-dial painter studies, they might throw suspicion on radium. However, it is difficult to accept this hypothesis without an explanation of the lesser number of cancers found at higher radium intakes."

Thus the prestigious and respected BEIR IV report clearly concludes that no studies of natural radium in drinking water have ever been shown to pose a risk to the populations drinking such water. It is known that very high levels of ingested radium are capable of inducing malignancies, but due to the short range of the emitted radiation and to the fact that radium deposits only in bone, only two types of cancer have been induced in humans by radium. Other types have been alleged to have been induced, but there is no evidence to support these allegations. What other problems might internally deposited radium account for?

It has been suggested by several authorities that all levels of radiation are harmful, and if this is true then there should be some visible effects. One often suggested effect is a general, non-specific damage to the body, which will

done twice, once in 1978 by Stehney and co-workers[1] who examined the survival of pre-1930 radium dial workers and again in 1994 by Stehney[15] who expanded the study to include pre-1950 dial workers. In each case the results were the same; life shortening is visible, but when those cases who developed the well known radium-induced malignancies are removed from the study, so no radium-induced cancer cases are included, there is no life shortening. No matter how large an internal burden was acquired, those cases that did not have a bone sarcoma or a head carcinoma showed no life shortening. Since these malignancies occur only after very large radium intakes, which could be achieved only if drinking water contained about 1 μCi per liter, they are not relevant to the present concern about MCLs set at 20 pCi per liter.

Three recent publications deserve mention. Two of these came from Dr. Finkelstein of Toronto, Canada[16, 17]. He studied the relationship between the radium content of drinking water at the birthplace of children who ultimately developed childhood bone malignancies. The first of these studies[16] identified deaths of people 25 years of age or less in Ontario due to bone cancer between the years 1950 and 1983. There were 283 usable bone cancer cases. Their birthplace water was sampled for radium between 1987 and 1992. Radium at a concentration of more than 0.19 pCi/l was found in the birthplace water of 15.2 % of those dying with bone cancer (this group of 43 cases is called the exposed group, the remaining 240 bone cancer cases from birthplaces with lower radium levels in the water are called the reference cases) but only 10.2 % of the controls (256 deaths from other causes than bone cancer) were found to have birthplace water above this level. This suggests that the radium level in the water might be the cause of the bone malignancies.

The following data for the bone malignancy (exposed plus reference) cases are taken from Table 3 of Finkelstein's publication.

	Exposed Bone Cancer Cases	Ratio	Reference Bone Cancer Cases	Ratio
Osteosarcoma	20	20/43 = 0.47	125	125/240 = 0.52
Ewings sarcoma	15	15/43 = 0.35	93	93/240 = 0.39
Chondrosarcoma	3	3/43 = 0.07	9	9/240 = 0.04
Other	5	5/43 = 0.12	13	13/240 = 0.05
Total malignancies	43		240	

Radium is known to induce osteosarcomas, but not Ewings sarcoma, chondrosarcoma, or other bone malignancies[18]. Thus one might expect to see a higher ratio of osteosarcomas in the exposed group than in the reference group. Instead we find in the exposed population 47 % of the bone malignancies were osteosarcomas while in the reference group 52 % were osteosarcomas, contrary to our expectations.

the age of 20 years born in Ontario who were diagnosed with primary bone sarcoma during the period 1964 to 1988; subjects in the previous study were excluded. (It is not clear how the cases in the two studies were selected; evidently not all cases were used, otherwise the cases in the two studies would overlap.) These were matched with control subjects diagnosed with other cancers. Radium levels in drinking water from birthplace homes were measured for all cases. Cases with birthplace water containing more than 0.19 pCi/l were classified as exposed, the mean birthplace exposure was 0.7 pCi/l. Of the subjects with osteosarcoma 17 % were exposed at birthplace but only 10 % of the cancer cases were exposed at birthplace. However, in this study there was no increase in bone sarcomas with increasing dose, that is, no dose response trend. The authors conclude "Our findings are compatible with the absence of risk at low doses, but they might also reflect inadequate statistical power to measure a true risk at environmental exposure levels".

In this second document the authors correctly point out that radium is not only acquired from drinking water, but also from food. Indeed, they note that food is a more important source than water, and estimate that "The average daily intake in food is about 1.1 pCi/day, although most residents of Ontario ingest less than 0.3 pCi/day from water." What they did not address is the fact that there are other sources of radiation in human bone. Good values for these quantities can be obtained from the NCRP[19]. For the radium isotopes they are 1.4 pCi per day for ^{226}Ra and 1.0 pCi per day for ^{228}Ra from food. The mean birthplace exposure of the exposed subjects was given as 26 mBq/l or 0.7 pCi/l. At an intake of one liter of water per day the mean ^{226}Ra intake is increased from 1.4 pCi/d to 2.1 pCi/d, or by 0.7 pCi per day.

The following table was taken from NCRP 94[19], Table 9.2, page 142. It summarizes the dose equivalent rates to bone surfaces from naturally occurring radioisotopes in the body. Bone surfaces are considered to be the critical tissue for the induction of osteosarcomas.

Radionuclide	Dose Equivalent Rate (μSievert per year) to bone surfaces
^{14}C	8
^{40}K	140
^{87}Rb	14
^{238}U - ^{234}Th	3
^{230}Th	6
^{226}Ra	90
^{222}Rn	14
^{210}Pb - ^{210}Po	700
^{232}Th	2
^{228}Ra - ^{224}Ra	120
^{220}Rn	<0.1
Total	1,100

delivered by these internal radionuclides plus that delivered by external radiation. The total bone surface dose equivalents listed below are from NCRP 94, Table 9.3, page 142.

Source	Dose Equivalent Rate (μSievert per year) to bone surfaces
Cosmic	270
Cosmogenic	10
Terrestrial	280
In the body	1,100
Rounded Total	1,700

Thus the contribution from environmental ^{226}Ra is seen to be a very small fraction (90/1700 = 0.05) of the total. When that small fraction is increased by 0.7 pCi per day, the net increase in bone surface dose equivalent is insignificant, indeed, less than the rounding error in the above summation, i. e., less than 3 % of the total. Thus it is difficult to see how this small addition to the total bone radiation dose could be responsible for an easily detectable increase in bone malignancies.

At one point in this second publication Finkelstein and Kreiger refer to a epidemiological study by Petersen et al[20]. In this study covering 13 years (1950-1962), 111 communities whose population grew from 708,000 to 908,000 people in that period in Illinois and Iowa were found to be consuming water containing more than 3 pCi/l. Note that this is a factor of 15 greater than the lower level used in the Finkelstein studies. These were matched with controls from similar communities where the water contained less than 1 pCi/l, which is a factor of five greater than the lower limit of the exposed level in the Finkelstein study. The authors reported that, using all malignant neoplasms involving bone as their criteria, in the elevated radium water communities the mortality rate was 1.41 deaths per 100,000 people vs. a rate of 1.14 deaths per 100,000 in the control communities. They did mention that the rate in Chicago, where the water contained only 0.03 pCi/l, was significantly greater than the control rate.

The authors wrote, but did not publish, an interim report, based on the same data set, which was obtained from the EPA Region 5 Library in Chicago[21]. In this report it states that only one third of the cases with deaths due to "malignant neoplasm involving bone" on their death certificates actually died of osteosarcoma of bone, and that only certificates mentioning sarcoma of bone should be used for bone sarcoma deaths. In this interim report they found that the osteosarcoma rate per million man years was 5.6 in Chicago, 5.5 in the elevated radium towns, and 4.9 in the control towns. They concluded that "no significant difference could be detected between the osteosarcoma mortality rate in towns with water supplies having elevated levels of Ra-226 and matched control towns with water supplies having negligible levels of Ra-226."

The importance of the Petersen paper lies in the fact that if radium in water was as dangerous at low levels as implied in the Finkelstein studies, then much larger rates would have seen in both the elevated communities and in the control communities relative to the rates in Chicago. Since in this large survey of bone sarcoma cases there is no evidence of an epidemic of bone sarcomas in the higher radium water areas, nor in the control communities, and since the radium levels in Illinois and Iowa waters are much higher than found in Ontario, then the must be some other explanation for the results found in the Finkelstein study.

The final study to be mentioned was an invited paper given by Rowland at the 27th Annual Meeting of the European Society for Radiation Biology, entitled Bone Sarcoma in Humans Induced by Radium: A Threshold Response?[22] At that I meeting I proposed that a threshold existed for the induction of bone sarcomas by internally deposited radium in humans, and that threshold was approximately 1000 rad or 10 Gy. In terms of initial systemic intake the threshold was approximately 79 μCi or about 400 μCi by oral ingestion. Below these thresholds there will be no malignancies induced by internally deposited radium. Previously in this document I calculated that a fifty year intake of water containing 20 pCi per liter of both radium isotopes would be equivalent to a total radium intake of 0.3 μCi. This is less than one thousandth of the oral threshold of 400 μCi and implies that there is no risk from drinking water containing radium at these levels.

The U.S. EPA, in 1991[3], stated that the lifetime risk of drinking 2 liters of water per day containing 1 pCi/l of ^{226}Ra was 4.4×10^{-3}, and that the lifetime risk of drinking 2 liters of water per day containing 1 pCi/l of ^{228}Ra was 3.8×10^{-6}. These were derived using a linear, non-threshold dose response, or risk function. At the proposed MCLs of 20 pCi/l for each radium isotopes, the lifetime risks for radium induced cancer deaths are, respectively 8.8×10^{-5} and 7.6×10^{-5}. While these are very low risks for the world we live in, I think the actual risk, from this source, are much lower. I think that there is no risk from drinking water containing radium at these levels.

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MARC
DUFF
STATE REPRESENTATIVE
Chair: Environment & Utilities
Vice Chair: Urban Education
Co-Chair: Joint Legislative Council

TO: Members, Committee on Environment

FROM: Representative Marc Duff, Chair

DATE: November 24, 1997

RE: Clearinghouse Rule Referral

The following Assembly Clearinghouse Rule has been referred to the Committee on Environment:

Clearinghouse Rule 93-188: Relating to standards for maximum radioactivity in community water systems and enforcement standards and preventive action limits for radioactive substances in groundwater.

The deadline for committee action on the rule is December 23, 1997. If you wish to submit comments or request a hearing, please do so in advance of that date. For a copy of the rule, please contact my office (6-1190).

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P.O. Box 8952
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608-266-1190
HOME: 1811 South Elm Grove Road
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414-782-0763
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MARC
DUFF
STATE REPRESENTATIVE
Chair: Environment & Utilities
Vice Chair: Urban Education
Co-Chair: Joint Legislative Council

TO: Members, Committee on Environment

FROM: Marsha Dake, Committee Clerk Marsha

DATE: December 3, 1997

RE: Items for December 9 Public Hearing

Attached please find copies of two Clearinghouse Rules, CHR 97-136 and CHR 93-188, which are on next Tuesday's committee agenda.

Also attached is an amendment to AB 516 submitted by Representative Johnsrud.

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STATEMENT TO ENVIRONMENTAL COMMITTEE
December 9, 1997

May it please the chair. I am Harold H. Fuhrman, one of the attorneys for the City of Waukesha and the Waukesha Water Utility. I am appearing here today in regard to one aspect of the proposed standards, specifically the proposed standard for radium 226 and radium 228, combined, at 5 pCi/l of water. The standard is identical with a maximum contaminant level that are both Wisconsin and Federal regulations for drinking water. However, the standard for drinking water is in the process of revision by the U.S. Environmental Protection Agency. That agency has proposed a new maximum contaminant level which is fixed at 20 pCi/l for each of the two radium isotopes: Radium 226 and radium 228. That revision of the maximum contaminant level is very important to the City of Waukesha and its water utility because the municipal water of the Utility is in conformity with the new maximum contaminant level proposed. The interim MCL of 5 pCi/l for radium 226 and radium 228, combined, represents a scientifically invalid standard that the Department of Natural Resources has stated is not currently being met by the Waukesha Water Utility. The cost of compliance with the standard would be in excess of 67 million dollars.

On December 3, 1997 I sent a letter to the Chair requesting a hearing on this subject matter which has been referred to both houses of the state legislature. The following day, December 4, 1997, I received a Notice of the hearing that is occurring here today. Obviously the hearing here today is not in response to my request but is a hearing on the same subject matter which had been planned by the Chair a little earlier. Nevertheless, I am prepared to speak briefly today in opposition to the request of the Department of Natural Resources and the Department of Health and Family Services. I do ask the Chair, however, that after hearing my remarks that this hearing be continued to a date in the future satisfactory to the Chair.

In my letter to the Chair I had indicated that the City of Waukesha would present a scientific consultant, Dr. Robert Rowland, to give testimony at the hearing requested. However, when I received the Notice of today's hearing on December 4th, I immediately contacted Dr. Rowland in Illinois to ascertain whether there was any possibility of his attending this meeting today. He indicated that he had a conflict and could not attend. In my letter I had indicated that I would be submitting to this committee a position paper giving greater detail as to the reasons why the City of Waukesha and its Water Utility are opposed to the request of the Department of Natural Resources and the Department of Health and Family Services. I still plan to file that position paper with this committee within the next two weeks.

I had indicated that Dr. Rowland would be absent from the country from February 19th through March 20th of 1998. I requested that the committee take this into consideration in fixing a date for the requested hearing. Of course I did not realize that this hearing

was already scheduled for today and, hence, I would surmise that the committee may be desirous of proceeding with some dispatch. Therefore, I asked Dr. Rowland whether or not he would be available any time this month. He said he would be available the 17th, 18th, and 19th of this month although January, 1998 would be preferable.

However, I wish to draw your attention to a very important point that I stated in my letter to the Chair, and that is that the U.S. Environmental Protection Agency (EPA), has scheduled a meeting of stakeholders involved in the radionuclide rulemaking regulation proceeding for December 11th and 12th, in other words for Thursday and Friday of this week to discuss the subject matter. I intend to be present in Washington on behalf of the City of Waukesha and the Waukesha Water Utility at this stakeholders' meeting.

The very fact that this meeting is being conducted this week by the EPA indicates that the EPA is anxious to have closure on the matter of federal rulemaking in regard to radionuclides. This fact in and of itself indicates the wisdom of patience in regard to this very important area of rulemaking since it involves not only the safety of the public but also immense public funds. In the meantime, the Department of Natural Resources, and the Department of Health and Family Services are proceeding with administrative rule changes which would establish a standard of 5 pCi/l of groundwater for radium 226 and radium 228, combined, the existing standard for drinking water.

The City of Waukesha and its Water Utility has opposed this change by appearing at a public hearing that was held by the Department of Natural Resources and Department of Health and Family Services in Waukesha earlier this year. At that time the City of Waukesha and its Water Utility presented the testimony of its scientific consultant, Dr. Robert Rowland. Prior to the hearing the City of Waukesha and the Waukesha Water Utility, pursuant to notice, filed with the DNR, the deposition of Dr. Rowland, and exhibits relating thereto including a copy of a 1994 book by Dr. Rowland entitled, Radium in Humans: A Review of U.S. Studies, commissioned and published by the U.S. Department of Energy.

Notwithstanding the testimony of Dr. Rowland, as well as the testimony of Mayor Carol Opel of the City of Waukesha, the proposed standard for groundwater for radium 226 and radium 228 at 5 pCi/l has now been formally recommended to the two houses of the Wisconsin Legislature for adoption.

Now addressing the merits of the proposal before you today, it is necessary for me to review briefly the history of the subject matter as it relates to the City of Waukesha and its Water Utility. In the year 1991 three major events occurred regarding this general subject matter. First of all the U.S. EPA formally announced the new proposed MCL, that is the maximum contaminant level, for radium

226 and radium 228 for drinking water at 20 pCi/l of water for each isotope. The announcement initiated a rulemaking proceeding. This, of course, was after years of study. The hearings on that particular rulemaking proceeding were held in 1991 in both Washington, D.C. and Chicago. The City of Waukesha and the Waukesha Water Utility appeared at these hearings and presented the testimony of their consultants in support of the scientific correctness of the proposed new maximum contaminant level.

The second major event which occurred in 1991 was the initiation of a rulemaking proceeding by the DNR relating to groundwater. That rulemaking proceeding was analogous to the one that is now occurring here. That rulemaking relating to contaminants in groundwater proposed an enforcement standard of 5 pCi/l of radium 226 and radium 228, combined in 1991 just as now. The City of Waukesha and the Water Utility objected to that proposed standard in 1991 as it is doing today in connection with the current rulemaking proceeding for groundwater. Dr. Rowland filed a paperwith the examiner and the Radiation Protection Council.

In 1991 Waukesha took the position that the rulemaking in regard to radium 226 and radium 228 should be postponed until after the EPA had completed its own federal rulemaking in regard to radium 226 and radium 228 as it pertains to drinking water. In fact the DNR did not adopt a rule for radium 226 and radium 228 for groundwater in the year 1991. However, now the Department is proposing again to adopt a rule for groundwater making the enforcement standard 5 pCi/l of water for radium 226 and radium 228, combined thus again following the MCL for drinking water for those two isotopes.

Prior to the requested continuation of this hearing after today's proceedings, The City of Waukesha intends to file with this committee a copy of the transcript of a deposition of Dr. Robert Rowland which was taken in November of 1996 for the purpose of preserving his testimony. Along with the transcript, Waukesha will submit exhibits including a 1994 book entitled, Radium in Humans: A Review of U.S. Studies, which was written by Dr. Rowland at the request of the U.S. Department of Energy to set forth the history of the studies of radium in the United States. The book is now the official history of the most intense study of radium by the scientific community covering a period of several decades. Many of these studies were conducted by the Department of Energy at the Argonne National Laboratory under contract with the University of Chicago. Dr. Rowland played a key role in that work and for that reason was commissioned to write the history of it.

In addition to that, the exhibits which we have filed with the DNR also include papers which Dr. Rowland has delivered more recently at Heidelberg and in France reflecting his continuing studies of the subject matter.

The third major event that occurred in 1991 was the commencement of an enforcement action by the DNR against the City of Waukesha and the Waukesha Water Utility to seek compliance with the interim maximum contaminant level for radium 226 and radium 228 at 5 pCi/l for those two isotopes combined. That litigation was settled by a consent judgment without prejudice and under that judgment enforcement proceedings are in abeyance until 1999 or an earlier time in the event the EPA completes its rulemaking in regard to radionuclides in drinking water before 1999.

At the conclusion of the Federal Rulemaking, the DNR will determine whether it is satisfied with the Federal Maximum Contaminant Level for radium 226 and radium 228. If it is determined that it is not, then the DNR will be at liberty to renew its litigation.

This is essentially a very brief sketch of the background information in regard to the concerns of the City of Waukesha and its Water Utility from a legal and administrative standpoint. We are asking this committee and the Legislature to postpone action on the proposed enforcement standard for radium in groundwater until the EPA completes its federal rulemaking in regard to radionuclides in regard to drinking water. This will be consistent with the spirit of the consent judgment.

For the record the City of Waukesha and the Waukesha Water Utility formally assert for their own account and as parens patriae for their citizens, taxpayers, inhabitants, property owners and rate payers that if the proposed standard is approved that this will infringe the rights of the objectors under the Fourteenth Amendment to the U.S. Constitution and under the Wisconsin Constitution, Article I, Sec. 1, both facially and/or as applied by depriving them of property without due process of law.

Once again, I request the Chair and the Committee that this hearing be continued to either a day certain or to a date to be fixed by the Chair for the reception of the testimony of Dr. Rowland and, if feasible, the testimony of Mayor Carol Opel of the City of Waukesha and the reception of written statements, documents, and exhibits. We suggest a date in January, 1998. In the alternative we suggest December 17, 18, or 19, 1997. The time for written comment should be extended at least to December 31, 1997.

Thank you very much.