RAS-1590

NEW MEXICO
ENVIRONMENTAL LAW CENTER

March 23, 2000

Office of the Secretary
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555-0001
Attn: Rulemakings and Adjudications Staff

RE: Matter of the Application of Hydro Resources, Inc., Docket No. 40-8968-ML, ASLBP No. 95-706-01-ML

Dear Sir or Madam:

Undersigned counsel hereby notifies the Commission and the parties that page 139 of Exhibit 1-B was inadvertently omitted from some copies of the Intervenors' Motion to Reopen and Supplement the Record (March 15, 2000). This omission occurred when Exhibit 1-B was duplicated for filing and service. Page 139 of Exhibit 1-B is attached here.

Counsel for ENDAUM and SRIC regrets any inconvenience that this omission may have caused.

Sincerely,

Lila Bird

Lila Bird

cc: Service List

Template = SECY-041

1405 Luisa Street, Suite 5, Santa Fe, New Mexico 87505
Phone (505) 989-9022 Fax (505) 989-3769 nmelc@nmelc.org

SECY-02

TABLE 4

Uranium and Silicon in Drinking Water, and Biomarkers for Renal Dysfunction Linear Regression Analysis

Variable	Urine albumin (mg/mmol creatinine) Slope coefficient[a]	P	Urine albumin (mg/liter) Slope coefficient[b]	P
U	−0.01	0.66	0.01	0.97
Si	0.07	0.21	0.19	0.86
U*	0.13	0.03	2.19	0.07
Si*	0.11	0.43	2.76	0.33

[a] Adjusted for age, diabetes status, and Si concentration (Si*).
[b] Adjusted for age, diabetes status, and U concentration (U*).
[c] U* (Si*) were calculated as the product of U (Si), as measured in the drinking water supply, daily water consumption (cups), and duration of stay at current residence (years).

call bias was unlikely. In fact, recall bias would likely artificially reduce the U effect since those who suspected that their drinking water was contaminated would simply switch to another source (e.g., bottled water).

Uranium is used primarily as a fuel for nuclear power reactors. It is also used in inertial guidance devices, in gyro compasses, as a counterweight for missile reentry vehicles, as shielding material, and as an X-ray target. Uranium in drinking water supplies results from its natural occurrence in bedrock and overburden, and human activity. *In situ* sources can contaminate both groundwater and surface water, this occurring more commonly in groundwater sources. In the present study, the isotopic ratios (U^{238}/U^{235}) were normal, corresponding to natural abundance; natural abundance was also confirmed for signals observed at mass 234. Although U is found in both food and drinking water, the opportunity for its ingestion via drinking water is usually greater than that via food (Cothern *et al.*, 1983). It was estimated that, when water concentration is higher than 10 μg/liter, drinking water contributes to more than 95% of ingested uranium (Cothern and Lappenwush, 1983). The chemical form for U in water is usually the uranyl ion UO_2^{2+} (Cothern and Lappenwush, 1983). Soluble salts containing this ion showed absorption levels reaching 1% for humans and many animals (Wrenn *et al.*, 1985). This ion was shown by ion chromatography to be present in free from in proportions ranging from 75 to 85% for all samples with total U concentrations >20 μg/liter (Lo *et al.*, 1994). Considering this speciation result and the present state of knowledge, the exposure to uranium appears satisfactorily defined by the soluble uranium concentrations, as determined in these water supplies.

There is not complete agreement in the scientific community regarding the uptake and retention of uranium. Significant gaps remain in our knowledge of U metabolism (Wrenn *et al.*, 1985). Nephritis is the primary chemically induced health effect of uranium in animals and humans (Hursh and Spoor, 1973). In a comprehensive review of the behavior and chemical toxicity of U, Leggett (1989) notes that, as early as the 1850s, it was suspected that U could induce glucosuria and renal dysfunction. In fact, U has been used in the experimental production of nephritis (Hodge, 1973). The pattern of this malady is described by the following sequence: polyuria, albuminuria, casts, glycosuria, oliguria, and sometimes anuria, ending in either uremic death or recovery (Cothern *et al.*, 1983). The two types of lesions in the kidney are glomerular and tubular.

Silicon levels showed a strong increasing relationship with urine albumin (data not shown), but the effect disappeared when they were adjusted for U (i.e., when U and Si were simultaneously entered into the regression model).

A limitation of this investigation is the inability to establish temporality with respect to uranium ingestion and albumin concentration levels. That is, since both entities were measured at the same time, it is impossible to determine whether the suspected exposure did, in fact, precede the effect. Another weakness pertains to the crudeness of the exposure metric. Thus, the exposure indices for uranium and silicon only pertain to the time spent at the residence occupied at the time of interview. Although some stability was noted between days during the present study, considerable variation over months or years are possible, as indicted by other studies (Health and Welfare Canada, 1987). Additionally, although information was collected about previous residences occupied by each participant, no data pertaining to the water quality at previous dwellings were available.

This study provides evidence for the relationship between uranium present in drinking water among humans and microalbuminuria, although the degree of albuminuria does not appear to be clinically significant. A similar study with more precise exposure data, and greater sample size to increase statistical power, would be a logical extension to that presented. Since urine albumin concentration levels increased significantly with the uranium exposure index at U concentration levels below the MAC found in the Guidelines for Canadian Drinking Water Quality (Health and Welfare Canada, 1993), it is reasonable to suggest that further study be undertaken.