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September 3. 2003

Ms Pamela Thompson, Project Manager
Weldon Spring Site Remedial Action Project
US Department of Energy

Fax: 636-447-0739

Dear Ms. Thompson:

Re: Proposed plan for final remedial action for the groundwater operable unit at the Chemical Plant area of the Weldon Spring Site.

These comments are being submitted as an addendum to the comments and attachments I submitted at the August 13 public meeting at the Weldon Spring Interpretive Center. I am writing again to urge the Department of Energy to make every effort possible to extract the contaminated groundwater and potentially releasable masses of radioactive materials lodged in the crevices of the bedrock at the Weldon Spring Quarry area and at the former Uranium Processing/Chemical Plant sites --- before decreeing those sites to be "cleaned up."

Or if it is not technologically possible or "too expensive" for the federal government to remediate the groundwater, I believe the DOE should declare the areas with the contaminated groundwater, aquifers and bedrock (areas that are both on- and off-site) to be off limits to the public --- as far into the future as the hazard persists. For example, 4.5 billion years times ten, for uranium-238. Wouldn't it be remarkable if a human institution could remain in control for even the first several decades?

I realize you are seeking comments that address the groundwater at the Chemical Plant. However, with the departure of the DOE perhaps imminent, I wanted to take this chance --- perhaps the public's last chance --- to urge you to stay around longer, **and not to walk away from the contaminated groundwater throughout the Weldon Spring Site.**

While we can hardly expect the DOE and its Weldon Spring project management contractor (Washington Group Intl. and Jacobs Engineering Group) to install even more monitoring wells and additional interceptor trenches --- which could further exacerbate the dispersal of the contaminants --- I believe they should at least warn the public of the clear and present and future dangers of the Weldon Spring ground- and surface waters. The DOE should at least explain to today's and future fishermen, water consumers, air breathers, Katy Trail hikers and bikers and other tourists, and residents that the locations, migration patterns, and health hazards of the permanently radioactive Weldon Spring groundwater wastes are not now and may never be precisely known or accurately predictable.

After Weldon Spring's one-billion-dollar cleanup, the public may well be disappointed and even incredulous to learn that things are not really all cleaned up. But I think an honest appraisal would be welcome, and from a health standpoint, should be required. I appreciate the efforts of the hundreds/thousands (?) of workers, administrators, engineers and others who have contributed toward the cleanup of Weldon Spring. I hope, however, that you will not lock up and leave until the groundwater is remediated and/or the public is responsibly warned --- in perpetuity.

1. **Mysterious meanderings of the Quarry groundwater:**

For as long as I can remember, when those of us who get our drinking water downstream from the Weldon Spring Quarry would ask why the highly contaminated Quarry groundwater was not detected in the St. Charles County well field, we would be told, "It gets captured by the Femme Osage Slough," that lies just to the south of the Quarry. (Highway 94 → Quarry → [Extraction/Interceptor Trench] → Katy Trail → Slough → Drinking Water Well Field → and then, the Missouri River, about 8 or 9 river miles above major St. Louis City and County drinking water intakes.)

If the contaminated Quarry groundwater has been migrating into the Slough for decades, why hasn't the Slough regularly overflowed? Where has all the Quarry water gone if, as we are told, it has never moved down-gradient into the well field and on into the Missouri River? I remember seeing the slough when it was completely covered by the 1993 flood waters. What happened to the Slough's contaminated sediment and soils at that time?

The explanations about the Quarry's groundwater migration have changed over the years. Now we are told the following about the fate and transport of the uranium in the groundwater within the alluvial aquifer --- north of the Slough and south of the Quarry:

> This area contains a naturally occurring oxidation/reduction front, which acts as a barrier to the migration of dissolved uranium by inducing its precipitation. .... A distinct contact was evident across the [geochemical] study area separating alluvial soils with characteristics indicative of oxidized conditions from those indicating reducing conditions. The oxidized/reduced zone contact is characterized as a change in the physical characteristics of the alluvial material with depth. The geochemical sampling program was designed to obtain soil and groundwater samples from discrete intervals from both the oxidized and reduced zones. ("Weldon Spring Site Environmental Report for Calendar Year 2002," DOE/GJ/79491-931; pp. 111-112)

And it goes on. I am sorry that I do not understand this verbiage. I just continue to wonder how decades of groundwater containing dissolved and solid uranium and thorium, and their daughters, could have flowed into the slough area and beyond without any of the contaminants' reaching the groundwater below and south of the slough --- including, of course, St. Charles County's well field.

Furthermore, if the radioactive wastes that have escaped via the Quarry groundwater path have indeed been adsorbed, reduced or otherwise entrapped in the reduction zone north of the Slough, why is the DOE not directing its Project Management Contractor to **exhume the accumulation of sorbed, contaminated soils and sediments in the reduction zone at this time**, and somehow isolate them? Or at the very least, why is the public not diverted away from that area? Shouldn't the Katy Trail be relocated away from the reduction zone? Shouldn't fishing in the Femme Osage Slough be prohibited by means of "institutional controls"?

2. **Groundwater impacts on the Femme Osage Slough:**

I have never understood why the Missouri Department of Conservation has allowed people to fish in the slough --- a major destination of the Quarry's solid and dissolved uranium, and of thorium (via colloidal transport, and perhaps in the form of thorium-nitrate or other dissolved thorium compounds. Thorium-nitrate is very soluble in cold water.) The slough is also a major destination of the thorium

and uranium daughter products. The radioactively hot Belgian Congo pitchblende wastes from the Downtown Mallinckrodt plant were dumped into the Quarry from 1959 till 1969. They were saturated by rain and snow over the years, and by the fluctuating water table, and were readily available to migrate out of the cracks and fissures in the walls and floors of the porous limestone Quarry, into the groundwater, and on into the slough.

While fishermen were always assured that it was safe to fish in the slough, an environmental monitoring report published by the DOE in 1982 makes such assurances seem highly suspect. I am attaching pages 18, 38 and 39 from the report, entitled "Weldon Spring Storage Site Environmental Monitoring Report for 1979 and 1980," by RB Weidner and MW Boback, of NLO (National Lead of Ohio). Laboratory tests of the slough fish found elevated levels of radioactive lead-210, total uranium, radium-226, and thorium-232 (with its incredibly long half-life of 14.1 billion years).

Apparently fish bioassays were not performed to test for the predominant Quarry contaminant, thorium-230. I would think that at the very least, bottom feeders may have ingested thorium-230 from the slough sediments. And no doubt, still are. (Thorium-230 has a half-life of 75,400 years.) Tests were also apparently not performed to detect notoriously radiotoxic isotopes present in pitchblende --- actinium-227, for example, (with a 21.77-year half-life) and protactinium-231 (with a 32,500-year half-life). Uranium-235, the progenitor, has a half-life of 704 million years.

While the NLO lab data in the 1982 report indicate higher levels of radioactivity in the "bone portion" of the fish (bullhead, carp, and bass) than in the "edible portion," I've been told that many local fishermen grind up the whole fish --- bones and all --- to make fish cakes.

Fish bioassays performed by contractors subsequent to NLO have not reported levels as high in fish as those reported by NLO. Since the data analyzed by different laboratories are not consistent with one another, I believe the data cannot be considered a reliable basis for making a decision about the safety of the fish. If any uncertainties exist about the migration into the human biosphere of these long-lived, known carcinogens, and if the DOE refuses to clean up the groundwater, or lacks the requisite technologies to do so, then I believe fishing should be prohibited in the potentially affected bodies of water --- including the Femme Osage slough; Busch Wildlife lakes 34, 35, 36 and the Hampton Lake; and the Dardenne Creek and other big and little streams and rivers.

3. The Quarry, and therefore its groundwater, are still contaminated.

Although the removal of the Quarry bulk wastes was substantially completed in 1995, much contamination obviously still remains. A sample collected from a groundwater monitoring well, located in the alluvium between the Quarry and the slough, contained **4,420** picocuries of uranium per liter just last year, compared to the average background level of **0.93** pCi/L (according to the "Weldon Spring Site Environmental Report for Calendar Year 2002," pp. 94 and 56).

I do not understand why thorium-230, as the major contaminant in the Quarry, was not included in the interceptor trench field study at the Quarry. (DOE/GJ/79491-916. May 2003)

Even with access to state-of-the-art data collection and mapping technologies (e.g., math computer codes and the Geographic Information System), your ability today to predict the potential rate of natural attenuation of the Weldon Spring uranium seems to be drastically reduced by the many basic unknowns --- as is your ability to predict the migration of the uranium in the groundwater. If today's

scientists and engineers can only estimate and guess about the volumes, locations, migration rates, and directions of the uranium in the shallow aquifer and bedrock, what about predicting the future --- extending for the duration of uranium's radioactive, hazardous life of 4.5 billion years, times ten? And what about the other Weldon Spring radioactive contaminants of concern --- including, apparently, isotopes present in recycled (post-fission) uranium, such as technetium-99 (with its 213,000-year half-life). Technicians are supposed to work with Tc-99 only in a glove box; it is not supposed to be distributed where recreational visitors are apt to be exposed.

A revealing description of just one of today's many unknowns is included in the "Evaluation of the Performance of the Interceptor Trench Field Study" --- in this case, regarding the bedrock near the Quarry:

> An issue was raised regarding the estimate for the distribution coefficient for uranium in the bedrock portion of the aquifer. The uranium concentrations determined for the bedrock samples were low and may be at or near background. Background for uranium has not been measured for the bedrock units present at the quarry. For this least mass simulation, the model did not account for any uranium sorbed to the bedrock in the area of uranium impact, even though it is evident that some uranium must be present in the bedrock aquifer materials based on uranium concentrations measured in the rim wells at the quarry. The uranium is likely present as residual contamination possibly sorbed to aquifer material in secondary porosity features (i.e., fractures and solution features) in the limestone between the quarry and the area north of the interceptor trench, rather than uranium sorbed to the limestone itself. (Revision 0, May 2003, p.53)

Is it not probable that similar unknowns exist about the bedrock and groundwater at the Weldon Spring Chemical Plant area?

I would like to add one final observation about Metropolitan St. Louis' radioactive wastes, some of which we have had in our midst for 61 years (!!), and some of which will continue migrating above and below ground at the Weldon Spring Chemical Plant Site and Quarry, perhaps forever. I find it incomprehensible that the nuclear industry and its associates in the federal government are continuing to promote the production of new nuclear reactors and bomb designs, and the extended operation of existing reactors, when no known safe technology or location exists for the permanent disposal of the radioactive wastes such facilities have already generated. These wastes are distributed virtually nationwide and may never be able to be isolated from the human biosphere for the requisite millennia.

Perhaps you'll appreciate a favorite quote: "If you're not outraged, then you're not paying attention."

Sincerely,

Kay Drey

Encls: – Excerpts from NLO's Environmental Monitoring Report for 1979 and 1980.
– Questions about Weldon Spring's groundwater, etc., that I submitted to the DOE, 6/27/02.

NLCO-1176
SPECIAL
UC-11

excerpts

WELDON SPRING STORAGE SITE

ENVIRONMENTAL MONITORING REPORT

FOR 1979 AND 1980

by

Robert B. Weidner

and

Michael W. Boback

April 19, 1982

NLO, Inc.

P. O. Box 39158

Cincinnati, Ohio 45239

Natl. Lead of Ohio

PREPARED FOR THE

U. S. DEPARTMENT OF ENERGY

WEAPONS GROUP

UNDER CONTRACT NO. DE-AC05-76OR01165

Approved:

M. W. Boback
Director, Health & Safety Division

Approved:

R M Greenaway
Manager

Fish

For many years, the land along State Route 94 was a University of Missouri experimental area and access was restricted. On June 12, 1980, the land was opened to the public as the Weldon Spring Wildlife Area, administered by the Missouri Department of Conservation (MDC). Because the new land-use included fishing, arrangements were made with the MDC to collect fish specimens from the Femme Osage Slough for analysis.

On June 9, 1980, MDC personnel, using an electro-shocking technique, collected several species of Slough fish. The specimens were sent to a commercial laboratory where they were segregated according to species and disected. Samples of edible flesh and bone were taken for analysis. All samples were analyzed for total uranium, radium-226, lead-210, and thorium-232. Table 14 lists the results of these analyses. pp. 38,39

Radon-222

On June 9, 1980, passive radon monitors were placed at 14 locations at and near the pit area and quarry and at 3 offsite locations (see Figures 11, 12 and 13). These monitors consist of a special dielectric detector which is sensitive only to alpha radiation, such as that emitted by radon and its daughter products. The detector is mounted inside the bottom of a light plastic cup, about 3.75 inches high and 2.9 inches at the widest diameter (at the top). A special filter, supplied with the cup and installed over the mouth of the cup when the sampler is installed, prevents the entry of dust.

Table 14. Analysis of Slough Fish

	Sample Description	Analysis	Results ±2 stnd. dev.
1.	Four Bullhead	Gross Weight	339 gm
	Four Big Mouth Buffalo	Gross Weight	916 gm
			1255 gm
	Edible Portion	Wet Wt. for Analysis	534 gm
		Total Uranium	<2 ug/Kg wet wt.
		Ra-226	0.8 ± 0.2 pCi/Kg wet wt.
		Pb-210	6 ± 1 pCi/Kg wet wt.
		Th-232	47 ± 9 ug/Kg wet wt.
	Bone Portion	Wet Wt. for Analysis	102 gm
		Total Uranium	84 ± 15 ug/Kg wet wt.
		Ra-226	8 ± 1 pCi/Kg wet wt.
		Pb-210	29 ± 5 pCi/Kg wet wt.
		Th-232	<100 ug/Kg wet wt.
2.	Four Carp	Gross Weight	1859 gm
	Edible Portion	Wet Wt. for Analysis	834 gm
		Total Uranium	<1 ug/Kg wet wt.
		Ra-226	7.6 ± 0.4 pCi/Kg wet wt.
		Pb-210	2 ± 1 pCi/Kg wet wt.
		Th-232	55 ± 15 ug/Kg wet wt.
	Bone Portion	Wet Wt. for Analysis	158 gm
		Total Uranium	108 ± 15 ug/Kg wet wt.
		Ra-226	7.7 ± 0.7 pCi/Kg wet wt.
		Pb-210	26 ± 6 pCi/Kg wet wt.
		Th-232	150 ± 110 ug/Kg wet wt.
3.	One Large Mouth Bass	Gross Weight	420 gm
	Three Bluegill	Gross Weight	218 gm
	Six Sunfish	Gross Weight	318 gm
	Five White Crappie	Gross Weight	230 gm
			1186 gm
	Edible Portion	Wet Wt. for Analysis	434 gm
		Total Uranium	3 ± 2 ug/Kg wet wt.
		Ra-226	8.8 ± 0.7 pCi/Kg wet wt.
		Pb-210	4 ± 2 pCi/Kg wet wt.
		Th-232	<20 ug/Kg wet wt.

→

1 μg = 1/3 pCi U-238

Table 14. Analysis of Slough Fish (Cont'd.)

Sample Description	Analysis	Results ±2 stnd. dev.
Bone Portion	Wet Wt. for Analysis	91 gm
	Total Uranium	<20 ug/Kg wet wt.
	Ra-226	17 ± 2 pCi/Kg wet wt.
	Pb-210	<20 pCi/Kg wet wt.
	Th-232	<90 ug/Kg wet wt.
4. One Carp	Gross Weight	2392 gm
Edible Portion	Wet Wt. for Analysis	1178 gm
	Total Uranium	39 ± 4 ug/Kg wet wt.
	Ra-226	11.2 ± 0.6 pCi/Kg wet wt
	Pb-210	80 ± 8 pCi/Kg wet wt.
	Th-232	72 ± 19 ug/Kg wet wt.
Bone Portion	Wet Wt. for Analysis	166 gm
	Total Uranium	290 ± 20 ug/Kg wet wt.
	Ra-226	23 ± 2 pCi/Kg wet wt.
	Pb-210	26 ± 6 pCi/Kg wet wt.
	Th-232	<100 ug/Kg wet wt.

Questions submitted to the US Department of Energy at the public meeting in the St. Charles County Government Bldg., June 27, 2002. [Not verbatim]. Kay Drey:

A. Regarding the <u>disposal cell</u>:

1. Will the DOE have a continuing presence onsite at Weldon Spring to check to see that the remedy is still in place? Specifically, for example, in the case of the disposal cell: will the DOE be responsible for checking the top of the disposal cell to see if the "bathtub effect" has begun --- that is, to see if subsidence has occurred --- if the materials inside the cell have begun to collapse, causing the top to begin to sink, thereby causing rainwater to collect at the top of the cell?

2. What agency is to check to see how much radioactivity may be leaching into the groundwater? And how often?

3. What contingency plan is in place in the event the top of the cell begins to collapse, or if the level of contamination in the leachate indicates the cell is no longer providing isolation of the wastes from the environment?

B. Regarding the <u>groundwater</u> that flows below the Quarry and between the Quarry and the Femme Osage Slough --- and about the <u>sediments and soils</u> that are in and around the slough --- that is, in the area that drains into the St. Charles County public drinking-water well-field:

1. Will those soils and sediments be dug up? If so, who is to pay for that?

2. Who is to monitor the groundwater in that area for the next thousand years? And who is to pay for that?

3. Is there a contingency plan if the well-field becomes contaminated?

4. Will funds be given to the State Department of Natural Resources each year to oversee the monitoring activities at Weldon Spring?

C. Regarding the <u>health</u> of the St. Charles County citizens: (These questions were submitted in writing during the meeting, but were among an undisclosed number for which Pam Thompson announced, at 9:30 p.m., that no time remained.)

1. Is the Department of Energy planning to <u>fund</u> medical monitoring of people who live here in St. Charles County?

2. Is the DOE planning to do any epidemiologic studies?

3. I understand the Missouri Department of Health's study of infant mortality cost around a million dollars. Will the DOE reimburse the State for that study?

(I also mentioned my letter to Homeland Security Director Ridge, re concerns about the possibility that a terrorist could discharge explosives on top of the disposal cell, causing the dispersal of the wastes. I also said I have expressed concerns about the interpretive center ever since I first learned about it, and about inviting the public onto a site that will most probably still contain residual wastes.) #