GWOU ADMINISTRATIVE RECORD
SECTION TITLE:
GW-800-801-1.04

WSSRAP GWOU Correspondence (updated 8/18/00)

Name	Address	Date Received
Andy Ayers	6307 Delmar University City, MO 63130	6/19/00
Leland Nadler	130 Church Road Augusta, MO 63332	6/20/00
Yvonne Logan	36 S. Gore St. Louis, MO 63119	6/22/00
Charles Davidson Associate Executive Director Conservation Federation of MO	728 West Main Street Jefferson City, MO 65101-1559 (573) 634-2322 (800) 575-2322	6/22/00
* Chris McClarren (first letter)	3936 Fillmore St. Louis, MO 63116	6/26/00
Mike Dudley, Alderman Weldon Spring Board of Alderman	7 Whitmoor Court Weldon Spring, MO 63304	6/25/00
Leonard A. Sonnenschein, President St. Louis Children's Aquarium	416 Hanley Industrial Court Brentwood, MO 63144 (314) 647-9594	6/30/00
Daniel Carlin	6120 Kingsbury Ave. St. Louis, MO 63112	7/5/00
Byron Clemens	100 Arundel Place St. Louis, MO 63105	7/7/00
Tom and Jane Mendelson	110 Arundel Place St. Louis, MO 63105 (314) 862-1555	7/11/00
Dr. Michael Garvey, Vice-President Greenway Network, Inc.	P.O. Box 513 St. Charles, MO 63302-0513 (636) 947-0772	7/12/00
Ruthmary K. Deuel, M.D.	6423 San Bonita Ave. St. Louis, MO 63105	7/13/00
* Becky Denney (first letter)	625 Angenette Ave. Kirkwood, MO 63122-6220 (314) 821-5524	7/13/00
Jim Young	905 Lami St. St. Louis, MO 63104	7/14/00
Jackie Schirn / Bob Drzymala	137 Sylvester Webster Groves, MO 63119	7/14/00
Kathie Molyneaux	6701 Bradley, Apt. 6 St. Louis, MO 63139	7/17/00
Brigid K. McCauley	6309 Pershing Avenue University City, MO 63130	7/17/00
Sandra Delcoure Water Creek MO Stream Team #30	3029 Willow Creek Florissant, MO 63031	7/17/00
Charles J. Guenther, Jr. Prof., Engineering & Technology St. Louis Community College Margaret P. Gilleo Prof. Environmental Ethics Maryville University of St. Louis	40 Willow Hill road St. Louis, MO 63124	7/17/00
* received more than one letter		

St. Louis County Resolution	County Government Center 41 S. Central Avenue Clayton, MO 63105 (314) 615-5432	7/6/00
City of St. Louis Resolution St. Louis Board of Aldermen	Room 230, City Hall 1200 Market St. St. Louis, MO 63103 (314) 622-3287	7/19/00
Weldon Spring Citizens Commission	7295 Highway 94 South St. Charles, MO 63304	7/24/00
Pamela Hosler	6571 Arsenal St. St. Louis, MO 63139	7/25/00
Ed Mahr, Jr.	7480A Wise Ave. St. Louis, MO 63117	7/25/00
Alice Donaldson	522 N. Kirkwood Rd -2B St. Louis, MO 63122	7/31/00
Virginia Druhe	No address	8/2/00
Jean and Marvin Lucy	16016 Canterbury Estates Dr. St. Louis, MO 63021	8/4/00
Elaine and Harold Glassman	7 Hacienda Dr. St. Louis, MO 63124	8/7/00
Melody Trausch	1840 Shiloh Wood Road Chesterfield, MO 63005	8/8/00
Susan and Jay Jaffe	15322 Broeker Place Chesterfield, MO 63017	8/8/00
Milton Schlesinger, Ph.D. Prof. Emeritus, Washington U Sondra Schlesinger, Ph.D. Dept. Mol. Microbology Washington University	6320 McPherson Ave. St. Louis, MO 63130-4701	8/8/00
Roy Hengerson, Environmental Policy Director Mo. Coalition for the Environment	6267 Delmar Blvd., 2-E St. Louis, MO 63130	8/10/00
Nancy Burris	2516 Bremerton Road Brentwood, MO 63144-2204	8/10/00
Sharon Smith	4366 Maryland Ave. #105 St. Louis, MO 63108	8/11/00
Timothy Breeze	7261 Delmar Blvd. University City, MO 63130	8/11/00
Jill Williams	1002 Redemstion Way St. Louis, MO 63039	8/11/00
Andrew Neuman	No address	8/11/00
Elizabeth Summer	Clayton, MO	8/11/00
Pam Bleckredge	59 Rear Maryland Plaza St. Louis, MO 63108	8/11/00

Jean and David Weinstock	7731 Lacorn Ct. St. Louis, MO 63121	8/11/00
Margaret Stacy Goal	1126 Childress St. Louis, MO 63139	8/11/00
Jim Scheff	20 Crabapple Ct. St. Louis, MO 63132	8/11/00
Laura Carpenter Balding	61 Wolfram Road St. Charles, MO 63304	8/13/00
Daniel W. McKeel, Jr., M.D. Asso. Prof, Pathology & Immunology Washington U School of Medicine	5587-C Waterman Blvd. St. Louis, MO 63112	8/13/00
Vicki Burton	No address	8/14/00
Daniel F. Havens	8401 Cornell Ave. St. Louis, MO 63132	8/14/00
Marilyn Lipman	122 Plantation Dr. Creve Coeur, MO 63141	8/14/00
Susan Klarfeld	333 Falaise Drive St. Louis, MO 63141	8/14/00
M.M. Kleba	3929 Gusine Ave. St. Louis, MO	8/14/00
Cynthia Lomboty	229 W. Jewel Ave. Kirkwood, MO 63122	8/14/00
Becky Denny (second letter)	625 Angenette Ave. Kirkwood, MO 63122-6220	8/14/00
* Kay Drey (first letter)	515 West Point Ave. University City, MO 63130	8/14/00
Stephen Culver	202 Wolfram Rd. Weldon Spring, MO 63304	8/15/00
Kim Kitson	4927 Quincy St. St. Louis, MO 63109	8/15/00
* Virginia Harris (first letter)	556 Oakhaven Lane Creve Coeur, MO 63141	8/15/00
Kathy Collins	26 South Joyce Ellen Way St. Peters, MO 63376	8/15/00
Arlene Kendle	6947 Columbia Ave. St. Louis, MO 63130	8/15/00
Dorothy M. Moore	Three Creek Farm 71 Wolfram Road Weldon Spring, MO 63304	8/15/00
Ellen Sue Goodman	12892 Castletault St. Louis, MO 63141	8/15/00
Mike Duvall Director, St. Charles County Division of Environmental Services	201 North Second Street, Room 433 St. Charles, MO 63301	8/15/00

* Judith Medoff, Ph.d. St. Louis University (first letter)	3507 Laclede Ave St. Louis, MO 63103	8/15/00
Mary T. Dzieniuk	5054 Potomac St. St. Louis, MO 63139	8/15/00
Saundra A. Lowes	7425 Teasdale St. Louis, MO 63130	8/15/00
Pamela Loderovick	8 Fair Oaks St. Louis, MO 63124	8/15/00
Mary A. Halliday	97 Wildllife Lane Defiance, MO 63341	8/15/00
Caroline Pufalt	13415 Land O Woods #3 Chesterfield, MO 63141	8/15/00
Pat Harlan	26 Rolling Rock Ct St. Louis, MO 63124	8/15/00
Debbie Cole	346 Woodmere Dr St. Charles, MO 63303	8/15/00
Fran Sontag	6671 Kingsbury St. Louis, MO 63130	8/15/00
Kathleen O'Keefe	634 Sherwood Dr. Webster Groves, MO 63119	8/15/00
Janet and Bernard Becker	4498 Laclede Ave St. Louis, MO 63108	8/15/00
Thomas Brown, Mayor St. Peters, MO	City of St. Peters One St. Peters Centre Blvd St. Peters, MO 63376	8/15/00
Laura Ellsworth	No address	8/15/00
Unable to read	No address	8/15/00
Jim Goodwin	No Address	8/15/00
Thelma Schaefe	No address	8/15/00
Mary Lou Ryan	6 Wakefield Dr. St. Louis, MO 63124	8/15/00
Dorothy C. Poor	8173 Stratford Dr. St. Louis, MO 63105	8/15/00
Margie Kohn	No address	8/15/00
Helene Frankel	116 Lake Forest St. Louis, MO 63117	8/15/00
* Gart F. Fort (first letter)	31 Briarcliff St. Louis, MO 63124	8/15/00
Jim Talent / Kenny Hulshof Members of Congress	1022 Longworth HOB Washington, D.C. 20616-2502	8/15/00

Rebecca W. Wright MO. Coalition for the Environment	2011 Rutger St. St. Louis, MO 63104	8/15/00
* Kay Drey (second letter)	515 West Point Ave. University City, MO 63130	8/15/00
Richard Dreyer	P.O. Box 6933 St. Louis, MO 63123-0233	8/16/00
G. Clare Laune	16651 Caulks Creek Ridge Chesterfield, MO 63005	8/16/00
Rebecca Wiederkehr	1514 Robin Hood Ct. St. Louis, MO 63122-5549	8/16/00
Louise Green	11 Litzsinger Lane St. Louis, MO 63124	8/16/00
Lee Potts	1514 Robinhood Court St. Louis, MO 63122-5549	8/16/00
Claire L. Schosser	5304 Fletcher Ave. St. Louis, MO 63136	8/16/00
George Boniface	6306 Southwood Avenue 3W St. Louis, MO 63105	8/16/00
Mary Louise Porcelli	2378 Half Moon St. Louis, MO 63114	8/16/00
Chris McClarren (second letter)	3936 Fillmore St. Louis, MO 63116	8/16/00
Diana Holman	11 Rutherglen Dr. Valley Park, MO 63088	8/16/00
Judith Medoff, Ph.D.,Professor of Biology St. Louis U. (second letter)	3507 Laclede Ave. St. Louis, MO 63103-2010	8/16/00
Virginia Harris (second letter)	556 Oakhaven Lane Creve Coeur, MO 63141	8/16/00
Kathy Lewis	120 Cornelia Ave. St. Louis, MO 63122	8/16/00
Louise McKeon Belt	18318 Rieger Rd. Wildwood, MO 63005-8429	8/16/00
Gart Fort (second letter)	31 Briarcliff St. Louis, MO 63124	8/17/00
Leonard Weinstock, M.D. Specialist in Gastroenterology	10287 Clayton Road, Suite 200 St. Louis, MO 63124	8/17/00
Donovan Larson, P.E.	9819 Mar-Ann Court St. Louis, MO 63128	8/17/00
Rick Cox	No address	8/17/00
Roberto J. Gutwein	7415 York Drive St. Louis, MO 63105	8/17/00

Rick Kelley

Riddles Penultimate Cafe & Wine Bar
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UNIVERSITY CITY, MO. 63130
725-6985

Mr. Stephen McCraken
Project Manager
Weldon Spring Site – DOE
7295 Highway 94 South
St. Charles, Missouri 63304
June 17, 2000

Mr. McCracken:

Thankfully, the Cold War is over. As the military confrontation has abated, we come more and more to confront the domestic consequences of the pell-mell rush to nuclear superiority that was the organizing principle of our Cold War policies. As we move into a new century and a new era of economic prosperity, it is critically important that we, the Cold War generation, do not bequeath to our children a legacy of radioactive contamination that the general public is still only dimly aware of having created.

Long after the threat of Stalin and Khrushchev recedes from our collective memory, our children will curse our imprudence if we fail to take every reasonable measure to deal with the long term radioactive consequences of our short term political decisions. That is why the work in which you are engaged is so very important. While the costs of seeing this job through to completion may seem high to us today, it will never be less expensive in the future; as the contamination we splashed about the countryside migrates into the larger ecosystem, further cleanup tomorrow will be a far larger and more expensive job.

I understand that you propose now to leave the contaminated groundwater at the Weldon Spring site in place. I don't believe I can emphasis too strongly my disagreement with that position. Declaring the clean-up complete while this menace still lurks under ground would be a grave mistake. If we risk error, as indeed in all human endeavors we do, it is critically important that we error on the side of caution now that the political momentum to clean up the site has carried us this far. If we only maintain the site as a working laboratory to perfect the technologies necessary to see the task through, this is far preferable to walking away from a job unfinished, telling ourselves we've done the best we could.

POINTS TO MAKE

- ~~NOT "DECIDING" TO LEAVE~~
- URANIUM NOT AN ISSUE IN G.W
- ~~[illegible]~~
- CLEANUP NOT FEASIBLE . . .
- NO CURRENT OR FUTURE HEALTH RISKS.

024456
JUN 19 2000
University City

In the twentieth century, when our goal was to assemble the most awesomely destructive nuclear arsenal of any people on earth, we invested the time necessary, marshaled the intellectual resources required and spent whatever it took to meet that challenge. Our task now in the twenty first century, an equally compelling one, is to rectify the unintended consequences of that earlier decision. We owe it to the successive generations of Americans who will populate this land around the confluence of the two major rivers in the center of the continent to move beyond the short term thinking that led us to this pass.

As the DOE project manager, I believe that your advice and recommendations on this matter are vitally important to the outcome. Consider this to be a personal plea, Mr. McCracken, to take the larger view and come down on the side of the people like myself, who were born and raised here, who drink the water from these great rivers, whose children and grandchildren will live here across the breadth of this new century.

Finish the job. Please.

Sincerely,

Andy Ayers

1-15-2000

Mr Stephen M. Mikrakim
Weldon Springs Remedial Action Project
8295 Hi-Way 94 South
St. Charles Mo.

I couldn't help but notice the Notice in the Wentzville Journal. This is getting more ridiculous every day. I was working for Missouri Highway Department when this so called contaminated material was Hauled to the quarry in open dump trucks and they were loaded so full that the material was falling of on all sides along the highway. I was mowing right of way at the time and doing it with a rotary mower. I also know that St. Charles, Warren & St Louis Co Highway Dept. Hauled cedars from the plant to spread on the Hiway. How are we going to clean up what was spilled along the Hyway? if this is really so contaminated. I keep wondering now that I hear & see all this maybe that is why I had a real bad sinus infection at the time I was mowing in that, but I am now 80 years old so far it hasn't killed me I don't know if anyone else has I just want some one to know what all this foolish spending money is doing. Thanks for reading this.

Leland Nadler

024458

JUN 20 2000

Leland Nadler
130 Church Rd.
Augusta, MO 63332

ST LOUIS MO F&DC 06/19/00 DCR 11:

JUN 19
PM
2000
63332

Mr. Stephan McCrackam
Weldon Springs Site Remedial
7295 Highway 94 South
St. Charles, MO. 63304

63304+2203

"The good we secure for ourselves is precarious and uncertain... until it is secured for all of us and incorporated into our common life."

Jane Addams
(1860-1935)

First President of the Women's International League for Peace and Freedom.
Nobel Peace Prize Winner, 1931

36 S. Hoe
St. Louis MO
63119

June 2

Dear Mr. McCracken -

You cannot ignore the radioactively contaminated groundwater at Weldon Spring. This will spoil both St. Louis and St. Charles water. The Dept. of Natural Resources thinks you are wrong - please listen to them. Our health is at stake!

Sincerely,
Yvonne Hogan

K. Kelley

Rcbk RE/Eng

Conservation Federation of Missouri

728 West Main Street ◆ Jefferson City MO 65101-1559
573-634-2322 ◆ 800-575-2322 ◆ 573-634-8205 (fax)

Ike Lovan
President

Dennis Ballard
Executive Director

Charles Davidson
Assoc. Executive Director

June 20, 2000

Mr. Stephen McCradeen
Project Manager
Weldon Spring Site
Department of Energy
7295 Highway 94 South
Saint Charles, MO 63304

Dear Mr. McCradeen:

The Conservation Federation of Missouri was recently made aware of a US Department of Energy proposal to walk away from radioactive groundwater at the former Mallinckrodt Chemical Works site at Weldon Spring. We were told that the reason for this decision is that it was determined that such cleanup of the contaminated groundwater would be technically impractical and not cost-effective.

We do not have all the facts, but this really concerns us. Since we have many members in this area and the possible contamination of their drinking water and recreation areas is at stake, we would like to hear from you about the extent of the contamination and how the decision was arrived at to leave it as it is.

Given the unfortunate location of their site above the Saint Louis and Saint Charles drinking water sources, it would seem that extraordinary measures may be called for in this cleanup.

Please respond as soon as possible.

Sincerely yours,

Charles Davidson

Charles Davidson
Associate Executive Director

024462

Dedicated to the conservation of our natural resources. JUN 2 2 2000

confedmo@socket.net ◆ www.confedmo.com

Rick Kelley

June 21, 2000

Dear Mr. Stephen McCracken:

I've lived all my life here in St. Louis and often visited the beautiful Missouri parks, national forests, pristine streams, rivers & springs. I've been all over Missouri. I've lived with the majesty of the Missouri and Mississippi rivers always before me. I've taken most of all this for granted for many years. Now I know better. I am educated about the legacy of radioactive waste that has been left me and all future generations. We all need to be educated about it. It is the human species' most lethal legacy and the earth's most pressing nightmare. As you are probably aware, thanks to human waste, mistakes, pollution, and lack of foresight, we are experiencing the 7th mass extinction. Every minute a new species goes extinct. We are adding eight people to the planet every three seconds. We have got to take responsibility for changing human values, human behavior, human beings if we and many species are to survive. Everything we do now counts tremendously. Your actions are really going to make a significant difference in whether we turn the tide and bring back sustainability. All actions added together will change things. With all that said, I will get to the specifics.

Please do not shut down your cleanup of the radioactively contaminated groundwater. Please clean it up - I am of course referring to the clean up going on at the Mallinckrodt Chemical Works at Weldon Springs. Please hear my plea. I happen to be writing you on the birthday of my five year old nephew Daniel whom I love very much. This is his birthday present - writing to you to ask you to do this for him and all children. Imagine the cumulative legacy of toxins which have built up in the environment that we have left for them. I am sometimes so scared for future generations. I wonder about the cancer rates are going to look like. They are soaring as we speak. You can do something about this. Turn the tide. Who cares if it is technically impractical or not cost-effective. Can we ever place a value on future generations, our rivers, our planet and say it's not worth it? The cost to us all of not cleaning it up will be so great! I don't think you will find it easy to have on your conscience that you did not continue to finish the job right, no matter what. Let's not have any more of a radioactive legacy than we have to. The Missouri 2

JUN 26 2000

024467

Mississippi River have been poisoned enough. We can't afford to add anymore poison. We've already created a "cancer alley" out of the Mississippi.

So please, let's use all the technology that I know is available to you to remove as much of the waste from the groundwater as possible. Let's also be willing to continue to work on and test technologies that could reduce the hazards even further at this site on into the future. Everything possible needs to be done until the groundwater is truly safe.

Thank you sincerely,
Chris McClamen
Founder of St. Louis Earth Institute
(a Project of Sustainable St. Louis)

Chris McClarren
3936 Fillmore
St. Louis MO 63116

ST. LOUIS MO
PM
13 JUN
2000

Mr. Stephen McCracken
Project Manager
Weldon Spring Site - DOE
7295 Highway 94 South
St. Charles, MO 63304

63304+2303

Rick Kelley

Mike Dudley
7 Whitmoor Court
Weldon Spring, MO 63304

Mr. Stephen McCracken, Project Manager
Weldon Spring Site – DOE
7295 Highway 94 South
St. Charles, MO 63304

Dear Mr. McCracken,

It is my understanding that the Department of Energy has determined that no further cleanup is necessary to the groundwater at the Weldon Spring site. It is also my understanding that the Missouri Department of Natural Resources disagrees.

I would appreciate it if you could supply me with an explanation of the rational that brought the DOE to its conclusion and why the Missouri DNR disagrees. I admit that I am not a scientist in this or any other area but radioactive waste has half-lives of centuries. That means that our focus must be on the levels of radiation and how it compares to established acceptable standards. Hopefully that is the subject of the information that I will receive.

I am an Alderman in Ward II of Weldon Spring and am writing on behalf of my colleagues. For obvious reasons we are very interested in the progress and outcome of this project.

Sincerely yours,

Mike

Mike Dudley

K- Kelley

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6/27/00

Mr. Stephen McCracken
Project Manager, Weldon Spring Site - DOE
7295 Highway 94 South
St. Charles, MO 63304

Dear Mr. McCracken:

I am constantly amazed at what our federal government does without the forethought of Environmental History. History, by some accounts, can only take place after 50-100 years after an event for it to be classified as Historical. As we look at the History of Radioactivity & Humans and Environment over the past several hundred years we can see that government's intrusion has created hazardous consequences on us and our environment insofar as radioactivity is concerned.

Ground water contamination from uranium and thorium nuclear weapons production at the Weldon Springs site has created a measurable effect in terms of waste release of alpha particles and tridium consequences. Historical evidence is now emerging to show hazardous health consequences can result.

I recommend, as a known ombudsman for the community, that all efforts should continue at the Weldon Springs site for cleanup of the ground water contaminants.

Sincerely,

Leonard A. Sonnenschein
President

024476

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Committed to Learning by Participation

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JUN 30 2000

R. Kelley

July 2, 2000

To: Mr. Stephen McCracken, Project Manager, Weldon Spring Site Remedial Action Project, US Department of Energy.

CC: Mr. Dennis Grams, P.E., Regional Administrator US Environmental Protection Agency, Region VII,
Mr. Stephen Mahfood, Director Missouri Department of Natural Resources.

The Department of Energy has consistently given two justifications for its proposed abandonment of the Weldon Springs site without cleaning it up and neither of them is valid. The first of these justifications is the preposterous claim that the area, including the ground water, is clean, and thus there is nothing more to do. This is entirely untrue, as the DOE's own reports, as well as other sources, attest.

The second justification that has been given is that even if the area were contaminated, the technology needed for clean up is either not available, too expensive, or a combination of the two. This excuse is known as Technical Impracticability or TI, and the DOE claims that such a situation exists at the Weldon Springs site. Not only have the DOE's own reports admitted that several proposed clean up programs are entirely feasible, but an expert geologist's assessment of the situation was that Technical Impracticability could not be established, and that clean up of the site as requested by the Missouri Department of Natural Resources was perfectly possible.

There are several instances in which the DOE reports admit that the groundwater around the Weldon Springs site is contaminated:

1. On page 9 of the 1997 Weldon Springs Site Remedial Action Report (WSSRAP) a disturbing passage reads,

"The Femme Osage Slough, located approximately 213 meters south of the quarry, is a 2.4 km section of the original Femme Osage Creek and Little Femme Osage Creek. **The slough receives contaminated ground water migrating from the quarry, causing increased uranium concentrations in the slough. <u>The slough is used for recreational fishing.</u>**"

Not only does this statement show that uranium from the site has leaked into public fisheries, from which people can catch and eat contaminated fish, but it also admits that uranium from the quarry has indeed leaked into the ground water.

2. Further evidence of the presence of Uranium in the groundwater can be found on the same page:

"The quarry sump (which contains radioactive overflow from the quarry) interacts directly with the ground water"

024485

JUL 05 2000

And on page 97 of a 1994 US Geological Survey report entitled "Geohydrology, Water Quality, and Simulation of Ground-Water Flow at the Weldon Spring Chemical Plant and Vicinity, 1987-90," *Open-file Report 93-648*:

"Water samples from wells adjacent to pits (raffinate pits containing radioactive wastes from plant processing operations at the chemical plant site) indicate that water from the pits has entered the ground-water system and is present in the underlying bedrock."

3. The DOE has made the superficially reassuring statement that most of the sources of the contamination, such as the quarry wastes and the contents of most of the raffinate pits, have been removed. This doesn't solve the problem, though, of the contaminants that have already entered the groundwater and waterways of the area. The DOE has made some token efforts at cleaning up conspicuously contaminated areas such as some of the lakes in the Busch Wildlife Preserve, but it has left most of the contaminated areas, including the ground water, to become de-contaminated by "natural attenuation." It is technically true that the levels of contaminants in a given area will decrease over time by natural attenuation, but considering that Uranium 238 has a half-life of 4.5 billion years, the effects of this process could be a little slow in coming.

4. Further evidence of the ineffectiveness of removing the source of contamination can be found on page 1 of the report to congress, *Waste Disposal Effects on Groundwater* (David W. Miller Editor. Berkeley: Premier Press, 1980):

"Removing the source of contamination does not clean up the aquifer once contaminated. The contamination of an aquifer can rule out its usefulness as a drinking water source for decades and possibly centuries."

The ground water in the Weldon Springs area is a potential source of drinking water, and it interacts with the waterways that feed into the Missouri and Mississippi Rivers. Removal of the sources is not enough, we must make all efforts to clean up the groundwater and the contaminated soil in the area.

5. In an open letter to the EPA, the DOE claims that it has made "sufficient investigation to conclude that, in this geologic setting, there are no treatment technologies that would help..." However, in its own WSSRAP Engineering Analysis of Remedial Action Alternatives, the DOE makes such statements as:

"All required technologies for preparing the wastes for off-site disposal are available"

and

"Difficulties related to the construction and operation of [the proposed clean up plans] are not anticipated."

6. Further, Missouri Department of Natural Resources geologist James Williams, when asked to

assess the technological feasibility of the proposed clean-up operations wrote in response that based on the facts about the area accumulated by him and his team, "Technical impracticability was not evident."

Mr. Williams recommended that :

"the DOE calculate the amount of all the contaminants of concern and then conduct pilot studies to determine what quantities of the contaminants can be extracted.."

and that

"During these studies area wells and springs should be monitored to determine if increased off-site migration of contaminants occurs."

7. Mr. Williams' expert analysis was that not enough is known about the contaminants present in the ground water, and that at the very least, extensive tests need to take place to determine how much and what type of contamination exists.

It is also unsure whether the results obtained by monitoring wells in the area is reliable. A new high for uranium was recorded during 1997 at one of the monitoring wells immediately after it was repaired. This suggests that the initial installment and/or construction of this well (and possibly others) was faulty and had been generating distorted results that understated the true concentration of Uranium in the groundwater. It isn't possible for such readings to be overstated, but if a well is installed so that more water enters than is supposed to, the readings will be understated.

This seemingly inconsequential anecdote only serves to suggest that the DOE might not be capable of conducting its own research and of regulating its own activities, and that an outside agency might be necessary to make a dependable analysis of the level of contamination of the site, and the feasibility of its clean up.

8. A 1994 analysis of the Femme Osage Slough yielded a total uranium concentration of 4012 picoCuries/ liter (this is about 4000 times the normal level of Uranium in nature). Another sample taken later that month showed the level to be 100 pCi/L. This occurrence of "spikes" indicates the staggering levels of contamination passing through the public waterways. It also indicates that even though the sources of contamination have been removed, Uranium and other harmful substances are present in large quantities in the ground water and fisheries of the area, some of which feed directly into the main sources of drinking water for the St. Louis Metro Area: the Missouri and Mississippi rivers.

9. On page 57 of the 1994 US Geological Survey Open-file Report 93-648, it was found that the level of uranium in seep Tributary 5300 (A.K.A. the Southeast Drainage), which feeds directly into the Missouri river, was 2400 micrograms/L, four times the DOE accepted level (which is already 600 times the level in nature). A tributary of Schote Creek was found to have uranium levels of 4600 micrograms/ L, almost eight times the DOE levels, and more than 10,000 times the levels in nature. (page 58)

10. A simple reminder of the legacy that the DOE has created in the area of chemical and radioactive waste contamination, can be found in the Government Accounting Office Performance and Accountability Series report which mentions one flagrant, documented occurrence of negligence by the DOE which resulted in contamination of the ground water at the Brookhaven National Laboratory in Long Island. At this site, "radioactive tritium leaked into groundwater for years because DOE's weak organizational structure discouraged effective oversight of the contractor's operations." (GAO/OCG-99-6. Department of Energy Challenges, page 7)

The area in question is a crucial one for the St. Louis area, and all of Missouri. The DOE has thus far succeeded well in maintaining the site, but the dangerous wastes present there have begun to escape the plant and threaten the surrounding ecology directly, and Missouri drinking water indirectly. The DOE has created a potential ecological disaster and is ready to walk away from the problem without solving it. We simply cannot let them do so.

Statement by

Daniel Carlin

6120 Kingsbury Ave.
St. Louis, MO
63112

To: Mr.Stephen McCracken
Project Manager
Weldon Spring Site- Department of Energy
7295 Highway 94 South
St. Charles, Missouri 63304
cc: Mo-DNR
From:
Byron Clemens
100 Arundel Place
St. Louis, Missouri 63105

Dear Mr. McCracken,

This is a commentary in regards to the Department of Energy Weldon Spring site remedial action proposal regarding possible treatment of ground water contamination. We know that the Weldon Spring Site was a very large operation from 1957-67 and that the site is on karst topography with porous limestone; sinkholes, losing streams and springs with runoff to the Missouri the Mississippi, Dardenne Creek and several public and private well sites. We also know that contaminants have migrated and continue to migrate around and off-site. We also know that several of the radioactive contaminants at Weldon Spring are long lived Uranium 238 with a 4.5 billion year half-life; Thorium 232 with a 14.1 billion year half-life; Thorium 230 with a 75,000 year half-life (which is highly radiotoxic) and Radium 226 with a 1600 year half-life. Several other Uranium daughter products are also a matter of concern as well as other nonradioactive contaminants.

According to the Draft Baseline Risk Assessment (DOE/or/21548-091) the southeast drainage "process outfall sender" showed elevated Thorium 230 as high as 5,610 pci/g and total Uranium at 455.9 pci/g; Lake 36 at 188.6 and elevated levels at Lake 35, Ash and Frog ponds. According to DOE/or/21548-091 an estimated inventory of 227,976 kg or 456,000 lbs or about 6 tons of uranium was released off site from "stacks, sewers and raffinate" from 1957-66. This report also says that the "chemical

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plant soils is the primary source of potential off-site" release of uranium to water. The following page estimates that the uranium concentrations in the lakes and southeast drainage will increase by "70% over the next 50 years due to uranium precipitation." Table 1.4-1 fined uranium levels in sediment at 55 pci/l in Lake 34; 81.9 pci/l at Lake 35 and 176.88 pci/l in the southeast drainage water.

In DOE/OR/21548-773 July 1999 WSSRAP Calendar p.205 Frog Pond is linked with annual precipitation before remediation and at NP-002 "total mass increased in 1998 **after** remediation" the same document refers to Ash Pond, "Ash Pond is a highly contaminated area" After remediation including the Ash Pond diversion channel. It is assumed that "the only water that flowed from Ash Pond was precipitation that fell directly on the pond area." In 1991 and 92 precipitation was less the 1990 but the uranium mass concentrations increased. In 1993 they decreased but- outfall contamination increased again in 1996 with the storage of contaminated soil and debris in Ash Pond in 1997 contamination increased again even though precipitation was less. In 1998 materials were removed and there was a subsequent decrease. It seems as if the pond leaked. Which calls into question the soil/clay makeup under all these ponds, lakes and pits. These areas have been leaking for decades since 1957. It seems as if some if not most remediated areas show lower levels (NP-0002 & NP-0005) of uranium mass water migration off site but some tended up (NP0003) because of the storage of materials. There is evidence throughout the site of subsurface discharge.

Ash Pond according to the document is managed to not exceed an outfall of 600 pci/l but according to EPA-570/7-81-001 ORNI/EIS-192/UI "Uranium in U.S. Surface, Ground and Domestic Waters- Volume 2" naturally occurring background in the United States is .071 pci/l in ground water and .29 pci/l in surface water. According to page 2 of DOE/OR/21548-379 "Quarterly Environmental Data Summary - 4th Quarter 1992" the average Weldon Spring site permissible releases are 200 X E.P.A. 's naturally occurring background estimate. Page 2 also suggests that DOE is setting as special "site specific" background level at the Weldon Spring site that is higher than the E.P.A.s and that a proposed "site specific" proposed maximum release level is 13.6 pci/l compared with .071 for background (seems high). DOE/OR/21548-379 finds that Nitroaromatic compounds are found in 34 ground water sites and levels have not improved with remediation a new "high level of TNT was found at MW-2006." There are also elevated levels of sulfates and nitrates as well as Uranium in Weldon Spring Ground water according to DOE/OR/21548-379 TNT is high MW-2006, MW-3003 is high in nitrates and MW-4023 is high in sulfates. GW-4023-Q492 had high levels of sulfates and nitroaromatics 2,4-DNT, 1,35-TNB and 2,8 DNT. And GW-4021-Q492 had Uranium levels above natural background. One well at the site had a reported level of 1,000 pci/l (it was stated that is was possible erroneous but the so-called, "historical levels" are considered accurate.) What Q.A. and Q.C. makes your numbers reliable? Springs in the area have levels as high as 110 pci/l. Ground water well sampling on site found 2,4 - DNT at 36 ug/l and PAHs at 5,100 ug/l.

The "Weldon Spring Baseline Risk Assessment of February 1989" on Table B-11 lists U238 contamination in the southeast drainage sediment and surface water at 190 pci/l as an average concentration with NP-001 at 685 pci/l, NP-005 at 712 pci/l and NP-107 at 550 pci/l.

Table B-12 which contains an analysis of fish taken from Lakes 34,35 and 36 indicates that they show levels of Uranium >2 mg/kg; Thorium 230 >3 mg/kg; Thorium 322 ≥4 mg/kg; Radium 226 3 mg/kg; Chromium >3 mg/kg; Anolar 254 >24 mg/kg.The same analysis of Lake 35 found elevated levels of TNT, 2,4-DNT, 2,6-DNT, Nitrates, Uranium, Radium and Thorium in sediment, plants, soil, fruits and vegetables - which would indicate that contaminants on and off site are concentrating in the food web. The sediment analysis found Chromium at its maximum plausible limit; TNT at its maximum plausible limit; 2,4-DNT at its maximum plausible limit; 2,6-DNT at its maximum plausible limit; Nitrates at an elevated level; Fluoride at an elevated level and PCBs at there maximum plausible limit. Table 3 finds Uranium 236 in soil at 1,000 X naturally occurring background Radium 226 at 12 X background and elevated levels of Thorium, Nitrates and Sulfates and indicates the presence of PAHS but as a matter of convenience provides no data.

Table B-6 shows that sediment in the Southeast drainage sewer has Uranium 238 levels > 720 pci/gm; Radium 226 > 100 pci/gm; Thorium 232> 200 pci/gm; Thorium 230 > 10,000 pci/gm. This would also indicate the off-site presence of other Uranium daughter products and nonradioactive toxins for which no data is presented.

Water at Burgermeister Spring show a Uranium level at 160 pci/L (compare at EPA background of .071) while the water at Lake 36 has a surface water level of 240 pci/l.

Table C2-9 and C2-10 gives best estimates of of risk and exposure form ingesting ground water from private wells and the data matches the maximum plausible intake for TNT, 2,4-DNT, 2,6-DNT, Nitrates and Uranium for an adult and child. D-23/D-32 and D-49/D-58 indicate that private well water has a total hazard index of 7.85 for and adult and 3.43 for a child - that matches the maximum plausible exposure rate for nitrates, PCBs and Uranium. The document also looks at dermal exposure from showering and inhalation. Once again carcinogenic risks are at the maximum plausible level. It is apparent that the ground water on and off site at Weldon Spring is contaminated - limited migration of the wastes remediation seems to have met some success (although some wastes apparently are still fluctuating in migration rates) which is commendable given the remarkably poor choice of siting on karst topography that impacts on the Mississippi and Missouri water sheds as well as the St. Charles public well fields (which there is evidence of radioactive waste migration in that direction too) . DOEs documents indicate that drinking water, showering, breathing and eating, rabbit, venison, fish or plants seems to add a significant level of risk to people in the area (hence your rationale for cleaning it up). I believe federal government should should provide for treatment of contaminated ground water for nitrates, sulfates, uranium and it's daughter products, TNT, 2,4-DNT, 2,6-DNT, PCBs and other known contaminants.

I have a few questions:

Q. The ground water is contaminated - if DOEs position is that the source of contamination has been remediated why do contaminant levels fluctuate? It seems as if contaminants are leaching through soil, clay and bedrock - what would change that? How might the contaminants that are currently migrating be removed?

Q. Has DOEs (and any other agencies) continued involvement overseeing the site been stipulated? (ie. 20 years from now - if monitoring indicates there is a sudden change in ground water impact what would trigger any institutional action or oversight (by whom)?

Q. What kind of research and data are there regarding what is under the soil, pits and bedrock?

Q. How deep are the soil, clays and bedrock? Are there contaminants entrapped beneath the surface?

Q. Could DOE clean up the ground water if it chose to? How? Is there a new and/or possible experimental technology to try our (?pressurized injection?) ? If not, would you inform the public that there is no technological fix for the contaminated ground water?

Thank you for your consideration and the opportunity to have my comments considered.

C. Savage

TOM AND JANE MENDELSON
110 ARUNDEL PL.
ST. LOUIS, MO 63105
314-862-1555

July 8, 2000

Stephen McCracken, Project Manager
Weldon Spring Site - DOE
7295 Highway 94 South
St. Charles, MO 63304

Re: Proposal to let untreated radioactive groundwater remain at Weldon Spring site

Dear Mr. McCracken:

Our recollection of early meetings and hearings on the DOE's proposed project at Weldon Spring is that the DOE sought to justify its plan to drain highly contaminated quarry water for ultimate release into the Missouri River on the basis that this was necessary to save nearby water-well fields from the leached effect of the quarry water. While no one lacked concern about potential contamination of the well fields, you'll recall that there was much challenging of the DOE's claim to be able sufficiently to clean the quarry water before discharging it into the river at a point not far upstream from intakes for drinking water plants servicing the metropolitan St. Louis area. We believe that we still cannot know the answer to this debate.

Thus we have now been put to the exposure to the "treated" quarry water for some years, with all attendant health risks. Yet it is our understanding that the DOE, in the face of opposition from the Missouri Department of Natural Resource, plans to walk away from contaminated groundwater at the site without availing of existing technologies that hold promise of removing much of the radioactive and hazardous waste contained in the groundwater. In sum, it is frankly incomprehensible that the DOE would subject residents of this area to the "treated" quarry water and then leave at the site untreated groundwater that poses much of the very same environmental threat for the elimination of which we have been forced to make a foreboding sacrifice in the quality of our drinking water supply.

The DOE is earnestly requested to reconsider its determination to abandon the groundwater.

Sincerely,

Tom Mendelson
Jane Mendelson

Tom and Jane Mendelson

024498

JUL 11 2000

Greenway Network, Inc.

Wednesday July 12, 2000

Department of Energy
Remedial Action Project Office
7295 Hwy 94 South
St. Charles, MO. 63304

Re: Public Comment Groundwater Operable Unit Chemical Plant

Sent via fax 636-447-0739 and mail

Dear Mr.Steve McCracken:

Greenway Network, Inc is a non-profit citizen group in St. Charles Missouri is strongly is opposed to any change in the status of the Dardenne Creek from "no discharge status" designated by the MDNR and Clean Water Commission. We are finalizing a 4 year MDNR Grant on the Dardenne Creek Watershed. Included in the Grant are the following: water quality data collection, public input, educational workshops, improvement in GIS, ARC/ INFO by CARES as partners (the Center for Agricultural, Resource, and Environmental Systems), formation of a Watershed Alliance, placement two continuous water gauges have been installed by the USGS and public meetings have and will be set in the future. We have finalized the " Dardenne Creek Wetland and Watershed Demonstration Project Protection and Restoration Plan".

To maintain a file of the impact of the water quality as a result of the chemical plant and to document the improved condition as a result of the quality DOE Restoration, please send all historic data of the surface water testing results of the surface drainage to the Dardenne Creek watershed, including the Lakes in Busch Wildlife, Shulte Creek and Dardenne Creek. Please also include the results of the Burgermeister Spring. We understand this is a task to isolate all this data but feel it would be helpful to monitor the effectiveness of the disposal cell and general site surface drainage over time. Also if a controlled wetland could aid in the removal of nitrates and other contaminants off site and on adjacent lands, perhaps it could be a consideration as a passive system. If the concept has merit, Greenway Network, Inc. could aid in networking agencies to that end. The Missouri Dept. of Conservation is more that able to maintain such a controlled wetland over time.

P.O. Box 513, St. Charles, MO 63302-0513 • Phone: 636-947-0772 Fax: 636-947-0778
E-Mail: greenway@cdmnet.com

At our board meeting of June 21, 2000, the board, after review of the conflicting opinions regarding Groundwater Remediation were in agreement with the evaluation proposed by our Missouri State Geologist. The following motion was made and unanimously passed. Greenway Network, Inc. would like to request the DOE to include this resolution and the above comments in the extended Public Comment Period on the proposed remedial action of this Groundwater Operable Unit. Please send fax to 636-947-0778 and 636-447-5546 if this letter is received and will be included in public comment.

Be it resolved that The Board of Greenway Network, Inc. has moved and unanimously passed that: The EPA be requested to set up an Independent Review Panel to objectively consider the dispute regarding the Groundwater Operable Unit of the DOE Weldon Springs Chemical Plant Site. A panel was set to review the groundwater contamination at the adjacent Army Reserve Site but no public review or comment was included? Further removal and characterization of the groundwater contaminants at the chemical plant site will at the least allow for a better evaluation of the integrity of the cell's function over time. Greenway Network, Inc. is asking that the Missouri Dept. of Natural Resources be a party to the Federal Facility Agreement (FFA). We would like to be informed as the stewardship, institutional control and long term monitoring plans are detailed and finalized. We feel that the MDNR should receive continual funding to monitor both sites (ie. County Well Field and Disposal Cell and adjacent properties) into the distant future. Also Greenway Network, Inc would like to support funding for MDNR and also also be a part of the ongoing discussion regarding the Natural Resource Damage Assessment.

Sincerely,

Dr. Michael V. Garvey

Dr. Michael V. Garvey V.P. Greenway Network, Inc.

c. Joe Ortwerth, St. Charles County Executive
Dan Wall, EPA Region VII
Steve Mahfood, MDNR Director
Mimi Garstang, MDNR/DGLS
Larry Erickson, MDNR/HWP/FFS
Weldon Springs Citizen Commission
Board Greenway Network, Inc.

Cassandra

Mr. Stephen McCracken, Project Manager
Weldon Spring Site-DOE
7295 Highway 94 So
St Charles MO 63304

7/12/00

Dear Mr. McCracken:

I am writing in regard to the proposed "cover up" of the remaining dangerous contaminated groundwater at the Weldon Spring site. It is inconceivable to me that there is currently NO suggestion to save St. Louis City, County, and St. Charles county drinking water from the radioactive alpha emitting (with it's hazards in terms of birth defects and cancer within the affected populations) contamination from the groundwater still left in and under the Weldon Spring Site.

Perhaps it's my concern and not yours because you don't live downstream of the Site. However, I cannot believe it is in your interest to ignore the threat that this type of radioactivity poses to one of the major population centers of the Midwest. The very nature of the geology of the area should be a red flag…sinkholes, limestone in layers, that unpredictably can conduct a bolus of the radioactivity to, say the Busch wildlife fishing area. You catch a fish there that has concentrated alpha emitters in it's muscle, and you and your family eat it. Well, not you, because you are well aware of the risks, but your neighbors or relatives get the leukemia and the hypothyroidism caused by the radioactivity.

The point is, the expense of covering up the need to clean up this contamination is potentially so great in terms of the life and well being of all of us here in the great rivers area, that much further study and effort put into HOW to effectively clean up this hazard will cost far less. And as you are the person in charge of the local process, I urge you to call for means of SOLVING, **NOT** COVERING UP, the problem.

Sincerely yours

Ruthmary K. Deuel, M.D.

6423 San Bonita Ave
St Louis, MO, 63105

CC Post Dispatch

024512

JUL 13 2000

Cassandra

Becky Denney
625 Angenette Ave
Kirkwood, MO 63122-6220
314-821-5524

July 11, 2000

Stephen McCracken
Project Manager, Weldon Spring Site - DOE
7295 Highway 94 South
St. Charles, MO 63304

Dear Sir:

I believe the cleanup must include the groundwater so that there is no further contamination of Dardenne Creek, the Missouri River or the Mississippi River. Continued control and testing of the water from this site is necessary since water discharges above drinking water intakes for St. Charles, St.Louis, and St. Louis County. I believe this can affect the health and well-being of present and future generations of Missourians.

I have enjoyed activities at Busch Wildlife and Weldon Spring Conservation Area for years and have seen an increase in the use of the areas as well as an increase in construction near these conservation areas. These are very important recreational areas for the people of St. Louis but the value of the area depends on healthy ecosystems surrounding and within the creeks and springs of the watershed. These recreational areas and the water sources will become more & more important to St. Charles County as reservoirs for birds, fish and other wildlife as time goes by.

Before the cleanup program commenced a retired employee of Mallinckrodt assured me that testing was done periodically and there was no leakage of radioactivity from the site. Since then modern science and technology has improved so we have changed our standards and procedures for dealing with radioactivity and I think that will continue to change. But, also, enough people had to question and organize before the cleanup was done.

Future inhabitants and users of this area should be alerted to what has been done here and what parts of the cleanup are still undone.

Thanks for your consideration.

Becky Denney

Becky Denney

024511

JUL 13 2000

C. Sarge

905 Lami St.
St. Louis, MO 63104
July 12, 2000

Mr. Stephen McCracken
Project Manager
Weldon Spring Site - DOE
7295 Highway 94 South
St. Charles, MO 63304

Dear Mr. McCracken;

I am very much opposed the Department of Energy abandoning the still severely contaminated Weldon Spring site. It is far from clean and every attempt must continue to be made to complete the clean up.

The most feared consequence at any radioactively contaminated site is that the radioactivity will migrate to groundwater and underground aquifers. It is obvious to everyone that at Weldon Spring this has already occurred. How can the Department of Energy declare the site clean and just walk away? It is absurd for us to resign ourselves to the ongoing contamination of St. Louis and its drinking water for billions of years just because the process has begun. Clean up efforts should continue even if no certain technology to deal with the entire problem is currently apparent. Partial improvements are far better than nothing. A fifty percent improvement will mean fifty percent less resulting cancer.

Please keep the clean up project open so that every existing and future technology can be employed to remove this threat from the St. Louis region.

Sincerely,

Jim Young

Jim Young

024514

JUL 14 2000

C-Storage

July 12, 2000

Mr. Stephen McCracken
Project Manager, Weldon Spring Site, DOE
7295 Highway 94 South
St Charles, MO 63304

Dear Mr. McCracken,

I am writing about the cleanup program at the former Mallinckrodt Chemical Works in Weldon Spring. Please clean up the radioactively contaminated groundwater. It is essential that the DOE radioactive & hazardous waste be removed from the groundwater before the cleanup program is ended. Thank you very much.

Sincerely,
Jackie Schirn
Bob Drzymala

Jackie Greenleaf Schirn
Robert E. Drzymala
137 Sylvester
Webster Groves, MO. 63119

024515

JUL 14 2000

(1. Storage

024528

July 14, 2000

JUL 17 2000

Mr. Stephen McCracken
Project Manager
Weldon Spring Site - D.O.E.
7295 Highway 94, S
St. Charles, Mo. 63304

Dear Mr. McCracken,

I am appalled to learn that the Weldon Spring site (formerly Mallinkrodt Chemical Works) may remain in its current toxic state without benefit of a thorough clean-up. Please assure me that this is not in our future.

Contaminated ground water shouldn't exist anywhere on this planet, but particularly <u>not</u> upstream from a major metropolitan area.

I urge you to contest the Department of Energy's proposal to stop the clean-up. Our future is depending upon it. You may use my letter as ammunition, if needs be. I

hope you will do the right thing.

Sincerely,
Kathie Molyneaux
6701 Bradley, Apt 6
St. Louis, MO. 63139

C. Sivage

6309 Pershing Avenue
University City MO 63130
July 13, 2000

Stephen McCracken
Project Manager, Weldon Spring Site – DOE
7295 Highway 94 South
St. Charles MO 63304

Dear Mr. McCracken:

Reading through the U.S. Department of Energy – U.S. Environmental Protection Agency -- Missouri Department of Natural Resources correspondence relating to the "Weldon Spring Site Groundwater Operable Unit" was a very disillusioning experience for a citizen with environmental interests, who thought that big government was good, and the EPA was the best.

The first lesson I learned is that federal bureaucracy seems to deal with questions and requests in one or more of three ways:

hide behind a wall of acronyms,
say there is no problem, or,
if there is a problem, say it can't be solved.

The second lesson is that DOE doesn't seem to learn lessons—even from its own history. The pattern being followed in the Weldon Spring cleanup has clear parallels in the pattern at the Hanford Site.

I find it interesting that in the Summary of Agency Positions (January 25, 2000) the MDNR repeatedly cites uranium "above acceptable standards both on and offsite," as one of the contaminants to be dealt with, and neither DOE nor EPA ever addresses uranium or any other radioactive substance in their answers, generally answering in terms of tricholoroethylene (TCE) only. Are they assuming we Missourians won't notice? The MDNR also says that "DOE has not demonstrated that [justification for a] waiver of the ARARS* for uranium due to Technical Impracticability exists."

*applicable or relevant and appropriate requirements

On March 10, 2000, James H. Williams, then Director, Division of Geology and Land Survey, and State Geologist, writes that "it is clear to me that technical inability to remove significant amounts of contaminants of concern has not been demonstrated by DOE." He makes it clear that the DOE has not done the research that would be required for any such demonstration—it simply does not have the data. "It is unknown what mass of contaminant is present in the fracture system versus the porous media matrix or at what rate the contaminant will diffuse and/or drain from the porous media to the fracture system under remedial conditions. . . . It is already known that the contaminants will naturally migrate off site—they have been for many years—as demonstrated by groundwater sampling at wells and local springs."

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JUL 17 2000

Not too surprisingly, on May 12, 2000, the EPA concluded that there were data and there wasn't a problem—or that where there was a problem there wasn't a solution, so EPA was off the hook. All this was stated in a blizzard of acronyms and without a single mention of any radioactive element (except one reference to MDNR's concern about uranium) in an eight page, single-spaced letter.

The EPA says that "drinking water standards are considered relevant and appropriate cleanup levels for groundwaters that are a current or future source of drinking water but are not relevant and appropriate for groundwaters that are not expected to be a future source of drinking water." Given that the groundwater from Weldon Spring has been migrating offsite, carrying its contaminants, "for many years" according to Mr. Williams, and that Weldon Spring is on a geological divide so that its water moves in more than one direction: into the Missouri River, drinking water source for St. Louis County, the Mississippi River, drinking water source for the City of St. Louis, and the well-fields that are the drinking water source for St. Charles County, it is surprising that "EPA expects to prevent further migration of the plume [and] prevent exposure to the contaminated groundwater" (Code of Federal Regulations on the EPA's groundwater oversight mandate) despite deciding to leave the contaminated groundwater untreated.

This is where the Hanford experience comes to mind. In 1997 a GAO report described how the DOE had, for 50 years and despite ever more evidence to the contrary, maintained that there was no danger of contamination by or migration of radioactive wastes (leaking from underground tanks), which were all the time moving into the ground water and toward the Columbia River. The DOE, claiming in Hanford as at Weldon Spring to be a competent environmental steward, was finally forced to admit "that it erred in not sufficiently studying the soil, which is called the vadose zone. . . . The reason that the department never studied the problem adequately, it now appears, is that it did not want to know." (New York Times, March 23, 1998) "The department had said for decades that no waste from the tanks would reach the ground water in the next 10,000 years at least, but it is already there." According to outside experts, the DOE, even after admitting there was a problem and that they didn't have enough information to make a cleanup plan, "was still relying on outdated models of the soil . . . and just doing business as usual." (All quotations are from the same NYT article.)

For this reason I find the DOE's and EPA's dismissal of James Williams's request for further study and more data on which cleanup decisions can be based quite distressing. According to M. Th. Van Genuchten and E. A. Sudicky, writing on "Recent Advances in Vadose Zone Flow and Transport Modeling," in Vadose Zone Hydrology (Marc B. Parlange and Jan W. Hopmans, eds, Oxford University Press 1999), "many models of varying degree of complexity and dimensionality have been developed . . . to quantify the basic physicochemical processes affecting transport in the unsaturated (vadose) zone" and it is now possible to model more than one solute (something DOE, stuck on TCE, doesn't seem willing to do). "The problem of coupling models for water flow and solute transport with multicomponent chemical equilibrium and nonequilibrium" can now be addressed, as well as "the overwhelming heterogeneity of the subsurface environment" and "coupling two interacting pore regions, the macropore

or fracture network and the micropores in soil aggregates or rock matrix blocks." This kind of study is exactly what Mr. Williams requested.

The DOE really could move into the present, adopt newer models, and abandon the style of "management" that prefers not to study the migration of contaminants through the vadose zone so that they won't know there is a problem. The DOE could study what is really going on at Weldon Spring and address the issue of radioactive contaminants, too.

Or, alternatively, it could continue intentionally ignoring problems. Perhaps DOE really prefers the fantasy version of life in which humans can control events in nature simply by saying that they do, and in which the "impact [of our actions, leaks, etc.] will be low or nonexistent" (page 5, GAO report: "DOE's Management of Single-Shell Tanks at Hanford, Washington," July 1989). Unfortunately, those of us who live in the real world feel a different impact.

Sincerely,

Brigid K. McCauley

Brigid K. McCauley

C. Savage

024524
JUL 17 2000

Comments for
July 14 Postmark deadline -

Cold Water Creek July 13, 2000
Sandra Delcoure
Val des Fleurs
3029 Willow Creek
Florissant, MO 63031

Dear Steve + DOE,

I hope you will do the best clean-up at Weldon Spring Site to safeguard St. Louis drinking water supply in the Missouri River. Once again, thanks for your clean up work at SLAPS and HISS and for Cold Water Creek.

Sincerely, Sandy Delcoure - Cold Water Creek Mo Stream Team # 30

C-Drey

40 Willow Hill Road St. Louis, MO 63124

July 14, 2000

Stephen McCracken
Project Manager,
Weldon Spring Site-- DOE
7295 Highway 94 South
St. Charles, MO 63304

Dear Mr. McCracken:

This is to express our opposition to the DOE proposal to invoke the claim of "Technical Impractibility" with regard to cleanup of groundwater at the Weldon Springs Site. The activities of the Government and its contractors over the last fifty years that caused the contamination in the first place should have been deemed technically impractical-- then we wouldn't be in the mess we are in. However, since the damage has already been done, it is our belief that cleanup of environmental damage, including the restoration of groundwater at the Weldon Springs Site, should take precedence over all other projects of the DOE.

We have reviewed the 1993 EPA publication, "Guidance for Evaluating the Technical Impractibility of Ground Water Restoration," and find it appalling that the EPA (which is charged with protecting our natural environment) would go to such lengths to accommodate the interests of polluters, and provide them with excuses.

Let the cleanup at Weldon Springs continue. Funding for this and other environmental repair should be diverted from nuclear weapons development and the Human Genome Project.

Sincerely,

Charles J. Guenther Jr.

Charles J. Guenther, Jr.
Professor, Engineering & Technology
St. Louis Community College

Margaret P. Gilleo

Margaret P. Gilleo
Professor, Environmental Ethics
Maryville University of St. Louis

c: Dennis Grams
Kay Drey

024525

JUL 17 2000

R-2
6/29/00

RESOLUTION NO. 4225, 2000

ST. LOUIS COUNTY COUNCIL

Introduced by Councilmembers O'Hara, Dooley, Young, Cunnane, Odenwald, Wagener and Quinn

RESOLUTION

WHEREAS, in today's society the health and safety of the community are most often entrusted to the stewardship of responsible public agencies; and

WHEREAS, in some instances, it is incumbent upon the people to raise their voices so that decisions on issues of a local nature be made with the interests of the local citizenry primarily at the core of the decision-making process; and

WHEREAS, the threat to safe drinking water for the residents of St. Louis County which stems directly from the failure of the Department of Energy to resolve satisfactorily the clean-up of radioactive contamination of groundwater at Weldon Springs is of such import, that the people must be heard;

NOW, THEREFORE,

BE IT RESOLVED BY THE COUNTY COUNCIL OF ST. LOUIS COUNTY, MISSOURI, AS FOLLOWS:

SECTION 1. The County Council urges the Department of Energy to extend the period within which written comment can be made concerning this vital issue to December 31, 2000.

SECTION 2. The Council further calls upon the people of St. Louis County to voice their concerns, and insist that currently available and promising technologies be tested which might reduce the hazards of radioactive waste flowing from the site.

24A-13

SECTION 3. The Administrative Director shall send a certified copy of this resolution to the United States Department of Energy.

ADOPTED: June 29, 2004

JAMES E. O'HARA

CHAIRMAN, COUNTY COUNCIL

ATTEST: JEANETTE O. HOOK
DEPUTY ADMINISTRATIVE DIRECTOR

CITY OF
ST LOUIS
BOARD OF
ALDERMEN

RESOLUTION NUMBER 79

WHEREAS, in today's society the health and safety of the community are most often entrusted to the stewardship of responsible public agencies; and

WHEREAS, in many instances, it is incumbent upon the citizens to add their voices so that decisions on public issues are made with the interests of the people primarily at the core of the decision-making process; and

WHEREAS, currently there is an ongoing concern over the Department of Engery's inadequate efforts to clean-up the radioactive contamination in the groundwater at Weldon Springs; and

WHEREAS, this groundwater flows into the Missouri River which is a primary source of water for the City of St. Louis; and

WHEREAS, it is of the utmost importance that the citizens of this City have the opportunity to join with the residents of St. Louis County in voicing their concerns on this vital issue; and

NOW THEREFORE BE IT RESOLVED by the Board of Alderman of the City of St. Louis that we join with the St. Louis County Council in strongly urging the United States Department of Energy to extend the period within which written comments can be made concerning the clean-up radioactive contamination of Weldon Springs until at least December 31, 2000 and we further direct the Clerk of this Board to send a copy of this Resolution to the United States Department of Energy.

Introduced on the 7th day of July, 2000 by:

Honorable Phyllis Young, Alderman 7th Ward

Adopted this the 7th day of July, 2000 as attested by:

Fred F. Steffen
Clerk, Board of Alderman

Francis G. Slay
President, Board of Alderman

C. Savage

Weldon Spring Citizens Commission
7295 Highway 94 South
St. Charles, Missouri 63304

July 24, 2000

Mr. Stephen McCracken, Project Manager
United States Department of Energy
Weldon Spring Site Remedial Action Project Office
7295 Highway 94 South
St. Charles, Missouri 63304

Re: *Second comment period for Proposed Plan for Remedial Action for the Groundwater Operable Unit at the Chemical Plant Area of the Weldon Spring Site, June 1999 (DOE/OR/21548-733).*

Dear Mr. McCracken:

This letter is in response to the USEPA's final decision rendered on May 12, 2000 regarding the dispute resolution process concerning the *Record of Decision for Remedial Action for the Groundwater Operable Unit at the Chemical Plant Area of the Weldon Spring Site*, September, 1999 (DOE/OR/21548-798). The Commission appreciates the opportunity to offer whatever guidance and perspective we can in operationalizing a workable plan to address the contamination of groundwater under the chemical plant area as well as adjacent areas that may be potentially impacted in the future. Based upon discussions with a representative from EPA's regional office at our last Commission meeting, it is clear that the initial proposed remedy has remained essentially intact with the addition of some suggested considerations for pilot studies to further clarify site hydrogeolic characteristics. This being the case, the general thrust of out comments remain substantially unchanged from our last response on July 7, 1999, although many aspects have been addressed or clarified since last year.

To summarize, the Commission agrees with the proposed action as described in alternative #9, combined with long-term monitoring of the groundwater and springs. This agreement is contingent upon additional strengthening of the plan most notably in the areas of contingency planning and long-term stewardship. We feel it is appropriate to address stewardship issues in this document since a stewardship plan is referenced in Section 2 of the GWOU ROD published in September, 1999. It is recognized that many of the stewardship issues identified here are currently under discussion and review and the progress is encouraging, however, these issues should be documented as a matter of public record and are thus included as part of this formal public response.

Our specific comments are presented below and are organized by major issue area.

024542

Issue #1 - Contingency plans

The proposed plan (alternative #9 + alternative #2) calls for waiting an appropriate amount of time (2-3 years) for the effects of the source reduction of uranium, nitroaromatics, and nitrate's around the ash pond and raffinate pits to be evaluated. The anticipated outcome, over time, is a decreasing concentration in the groundwater for all contaminants. The proposed plan calls for the incorporation of alternative #2 (long-term monitoring) to supplement the active remediation described in alternative #9. The only mention of contingency planning under either of these alternatives was in the FS in the discussion of alternative #2 where contingency measures aimed at developing alternative water supplies (drinking) for the public are discussed.

Uncertainties regarding the possible mobilization of uranium contamination in a shallow aquifer, although remote, suggest the desirability of contingency plans addressing possible *increases* in contamination concentrations to surface springs in the area and the associated risks to recreational visitors. Although the Commission believes contamination levels in groundwater will most likely decrease after the source removal, we believe it would be prudent to have, as a part of the plan, a more detailed contingency plan. The plan should outline a range of protective actions that address both surface water sources as well as drinking water sources complete with contaminant specific trigger levels for each action. The well field contingency plan provides a model of the type of staged controls and action levels we envision.

The issue of planned responses to exceedences of monitoring parameters and emergencies was brought up in the Commission's comments to REV. B of the DOE site stewardship plan. It was generally agreed that some form of contingency planning was advisable for a limited set for "credible and foreseeable events". Identification of these events is still needed as well as specificity in how these events would be dealt with (e.g. who is responsible for addressing problems?, how long does the process take?, who will be notified?, etc.).

Issue #2 - Comprehensive stewardship plan

The chosen alternative *should incorporate some form of long-term stewardship plan* as a supplement to the long-term monitoring and active remediation components proposed. If groundwater use restrictions will be required of adjacent landowners for the foreseeable future, then the anticipated stakeholders must be identified and the roles and responsibilities of all potentially impacted parties need to be considered.

Contamination above acceptable health based levels is likely to be present in the groundwater for at least the next 20-30 years. This will require some form of use restrictions that may well extend beyond DOE's property boundaries. The institutional controls and stakeholder agreements that will likely be necessary are currently under discussion and more detailed explanations are being developed in a sequential manner. The Commission agrees with this approach since information necessary to fully define many of the controls may not be available until years after the cell is closed.

The draft stewardship plan that the Commission has reviewed and submitted initial comments on is an encouraging first step toward addressing many of the long-term comprehensive issues of concern to the Commission. We welcome the opportunity to work with the DOE and the other stakeholders in the further refining of this plan as an integral part of the comprehensive remedy for the GWOU and site as a whole.

Issue #3 - **TCE cleanup goal/strategy**

The proposed alternative #9 does not specify exactly how many rounds of injection are to be administered, only a minimum (2). The stated objective of alternative #9 is to achieve a TCE concentration of 5ug/L or less. If the technology is unable to achieve the stated goal after a minimum number of injections, how will the DOE determine what ultimate level of remaining contamination is acceptable? In other words, how will the decision be made to either proceed with further rounds or to end the process?

The rationale in the GWOU ROD, September, 1999 (Sec. 6.7) states that injection will continue "for so long as the application is reducing the TCE concentrations in a cost-effective manner." Determining when the performance of the process is asymptotic is as much judgment as it is science and coupled with the added criteria of cost-effectiveness (another interpretive and debatable criteria) makes this rationale virtually open-ended. As a guidance and goal setting tool it is fine, but it is, in the Commission's opinion, too loose to be considered as a true performance benchmark.

The Commission recommends that the rationale for determining when the process should be concluded or extended needs to be decided, described, and explained in more finite terms beforehand. It is recognized that bench scale testing is required and the innovative nature of this approach has a measure of uncertainty associated with it. This is all the more reason to be up-front with the realistic limitations of what is achievable using the proposed technology and detailing the decision strategy so the public can track field vs. expected performance against a decided upon criteria. Establishing the strategy or decision parameters beforehand will hopefully minimize disputes over what is or is not the appropriate time to end or continue the remediation operation.

In summary, the Commission agrees with the proposed action as described in alternative #9, combined with long-term monitoring of the groundwater and springs. The Commission is also inclined to agree with the premise that mechanisms of natural attenuation will, over time, lessen the levels of contamination that remain in the groundwater at the chemical plant site. This agreement is, however, contingent upon the resolution of the issues identified in the comments above. The prospects for long-term community acceptance of this, the last of the major remediation components of the Weldon Spring Site, is inextricably tied to the government's commitments and responsibilities expressed in the Stewardship Plan referenced in this ROD.

The continued dialog with stakeholders in the evolutionary development of this plan will be the true testament to the ultimate success or failure of this project.

Sincerely,

Weldon Spring Citizens Commission

Weldon Spring Citizens Commission
Dr. Glenn Hachey, Chair
Richard Hampel
Fritz Hoffmeister
Paul Mydler
Donald Price
Larry Sharp

cc: Joe Ortwerth, St. Charles County Government
Mike Duvall, St. Charles County
Dan Wall, EPA Region VII
Robert Geller, MDNR
Larry Erickson, MDNR
Cindy Kemper, MDNR
John Young, MDNR
Tom Pauling, DOE

Cassandra
6571 Arsenal St.
St Louis, MO 63139
July 23, 2000

Mr. Stephen McCracken, Project Mgr. Weldon Spring Site - DOE
7295 Hwy 94
St. Charles, MO 63304

Dear Mr. McCracken:

I read about the radioactive groundwater at the Weldon Spring Site and am concerned about the tissue damage, leukemia, endocrine system disorders, and mutations it will probably contribute to.

I hope the DOE does not just walk away from the problem because it is difficult. I believe the Dept of Energy/ Federal Gov. should sponsor as much research to figure out how to convert nuclear waste into something benign as we spent in developing uses for it.

Pretending the alpha particles are not harmful will not help anyone. Please work to make the groundwater safe (lots of people live downstream!!) and/or work to stop the production of any more nuclear wastes ASAP!

Best wishes in your important job,

Pamela Hosler

(Pamela Hosler)

Cassandra

JULY 20, 2000

MR. STEVE MC CRACKEN
PROJECT MANAGER, WELDON SPRINGS SITE - DOE
7295 HI WAY 94 SOUTH
ST CHARLES, 63304 MO.

FROM ED MAHR,

MR. MCCRACKEN,

I THINK YOU HAVE DEVELOPED A CONSCIENCE IN YOUR MATURE YEARS. CONGRATULATIONS!

YOUR SOLUTION OF LEAVING THE RADIOACTIVITY CONTAMINATED GROUNDWATER ON SITE AT WELDON SPRINGS WILL UNDOUBTEDLY SLOW THE RATE OF GROWTH OF THE "DEAD ZONE" IN THE MISSISSIPPI RIVER DELTA AREA OF THE GULF OF MEXICO. AFTER ALL, 2 OF THE 4 STEPS NEEDED TO RID THE TREATED WATER OF WELDON SPRINGS RADIOACTIVITY, WERE NOT ACCOMPLISHED. NUMBER 1. THE EQUALIZATION OF BAD STUFF (YOU SHOULD HAVE USED A CANOE & PADDLE) NUMBER 2. THE BOTTOM LINER UNDER THE BAD WATER WAS NOT FLAWLESSLY SEAMED (SURPRISE!)

ONCE AGAIN —

BARRY COMMONER'S 4 RULES OF ECOLOGY:
EVERYTHING IS CONNECTED TO EVERYTHING ELSE;
EVERYTHING GOES SOMEWHERE;
THERE IS NO SUCH THING AS A FREE LUNCH;
MOTHER NATURE KNOWS BEST;!

I THINK MOTHER NATURE HAS LOCALIZED THE BAD WELDON SPRINGS PUS IN A PIMPLE ON THE SURFACE OF THE WATER OF THE GULF OF MEXICO, — A BAD D.O.E. JOB!

ANOTHER MAHR MADNESS — INSTEAD OF SHIPPING THRU MILLIONS OF PEOPLE BY TRUCK THE ATOMIC REACTOR RODS FROM BARNWILL, SOUTH CAROLINA, FOR A DISTANCE OF 2500 ± MILES TO IDAHO, WHY NOT TRANSPORT BY RIVER TO THE ATLANTIC OCEAN & THE GULF OF MEXICO AND RELOAD ON CONTAINER SHIPS & SHIP ~~[illegible]~~ THROUGH THE PANAMA CANAL UP TO THE PUGET SOUND NAVAL YARDS AND THE TRANSPORT BY TRUCK TO IDAHO.

ALL ATOMIC REACTORS ARE ON WATER WAYS TO DISPERSE THE RADIOACTIVITY WASTE. ///

PLEASE MAKE UP FOR THE BAD JOB. //

OR — HAVE THE SCIENTISTS OVER RULE THE LAW MAKERS & MAKE THE GENERATING PLANTS BUILD ADDITIONAL POOLS & STORE ALL OF THEIR WASTE ON SITE FOREVER OR UNTIL A BETTER IDEA COMES ALONG.

ED MAHR JR (THE SNOOP)
7480A WISE AVE
63117
(314) 645-4652

C. Spragg

522 N Kirkwood Rd-2B
St Louis, MO 63122
July 28, 2000

Mr. Stephen McCracken, Project Manager
Weldon Springs Site - DOE
7295 Highway 94 South
St Charles, MO 63304

Dear Mr. McCracken:

I was delighted when DOE began its program to clean up the Mallinckrodt plant at Weldon Springs. Why is the Dept proposing to leave radio-active contaminated ground-water without treatment? The clean-up which has been done has been expensive - treating the ground water will increase the total cost figure - but not to complete the treatment is a mockery of the money that has been spent.

In the 1957-67 era, existing knowledge of dangers posed in processing and discharging of waste materials were apparently ignored by the company and the government. Present knowledge about clean-up of sites may not provide a perfect answer - but surely we know more 33 years later.
Acting to our best knowledge now should help to make drinking water safer for the many people who are currently endangered. In trying, we will also add to our knowledge.

The clean-up must include contaminated ground water!

Yours truly
Alice Donaldson

024562

JUL 31 2000

FAX TRANSMISSION

TO: Stephen McCracken, Project Manager
Weldon Springs Site
U. S. Department of Energy

FAX: 636-447-0739

FROM: Virginia Drube

RE: Clean Up at Weldon Springs

DATE: August 2, 2000

I am very concerned that the clean up process of radioactive contamination at Weldon Springs site be thorough and complete – I have a vested interest since I live in St. Louis and drink water. I understand a proposal to terminate clean up is under consideration.

I realize this a very difficult situation because one does not want to stir up and transport radioactive materials. At the same time, the geology of the area makes it unfeasible to leave the contamination where it is.

I am urging you to move forward with groundwater clean up using technologies already in use for this purpose – and to experiment with promising new technologies. I cannot imagine a circumstance where such efforts would be more appropriate, since the site in question is in such close proximity to the sources of drinking water for two heavily populated counties and St. Louis City.

Please heed to concerns of those most affected by this situation.

024573

AUG 0 2 2000

August 4, 2000

Mr. Stephen McCracken, Project Manager
Weldon Spring Site - Department of Energy
7295 Highway 94 South
St. Charles, Mo. 63304
Fax 1-636-447-0739

Re: Clean up of Weldon Spring Radioactive Groundwater

Dear Mr.McCracken:

I am writing as a concerned citizen, requesting that clean-up efforts at Weldon Spring include clean-up of the groundwater to safe drinking water standards.

It is my understanding that DOE is proposing to only treat the groundwater for trichloroethylene (TCE) with no guarantee that this will be continued until acceptable standards are reached. Also, DOE proposed NO treatment for the radioactive contamination (uranium) or the explosives waste in the aquifer. I understand that technologies are available that can remove much of the radioactive and hazardous waste from the groundwater. I consider essential that these current technologies be applied to eliminate the hazards at this site.

Sincerely,

Jean M Lucy

Jean M. Lucy
16016 Canterbury Estates Dr.
Ellisville, Mo. 63021
(636) 227-4199

C. Savage

August 4, 2000

Mr. Stephen McCracken, Project Manager
Weldon Spring Site - Department of Energy
7295 Highway 94 South
St. Charles, Mo. 63304
Fax 1-636-447-0739

Re: Clean up of Weldon Spring Radioactive Groundwater

Dear Mr.McCracken:

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Sincerely,

Marvin J. Lucy

Marvin J. Lucy
16016 Canterbury Estates Dr.
Ellisville, Mo. 63021
(636) 227-4199

8-3-00

Dear Mr. McCracken,

I am extremely concerned about the current proposal (re: Weldon Spring Ground-Water) to leach contaminated water as it is — Without Treatment!

I cannot imagine any informed intelligent human being wanting these Radio-active materials leaching into our land & especially into our DRINKING Water!

Please, please care... protect us, our children and their children and

INSIST on cleaning up what will affect & effect us — for Millions of yrs to come! Think... fill up a glass of cool water and you drink it... or give it to a loved child — (knowing what you know can technically be "filed" —) and wonder... did I do all I could, NOT to jeopardize their well-being?!?

Thank you for removing this hazard for us all.

Claire and Harold Glassman
7 Hacienda Dr.
St. Louis, Mo. 63124

024582
AUG - 7 2000

C. Savage

August , 2000

Mr. Stephen McCracken, Project Manager
Weldon Spring Site - Department of Energy
7295 Highway 94 South
St. Charles, Mo. 63304
Fax 1-636-447-0739

Re: Clean up of Weldon Spring Radioactive Groundwater

Dear Mr.McCracken:

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Sincerely,

Melody Trausch

Melody Trausch
1840 Shiloh Wood Rd.
Chesterfield MO
63005

8-5-00

Dear Mr. McCracken,

I have two children, 8 and 5, and since we live near St. Charles, I read with great concern about the leaching of radioactive wastes into the water that we drink.

I do not want my girls, your children, or anybody having this ignored or "swept under the rug" because it is easier and costs too much money etc. etc. to prevent.

Without your help we are helpless.

I intend to inform more people to see that our welfare (health) is not in danger because not enough people know about this. Remove the danger!

Thank you

Susan and Jay Jaffe
15322 BROEKER PLACE
Chesterfield, Mo. 63017

024589
AUG - 8 2000

6320 McPherson Ave
St. Louis, MO.63130-4701
August 7, 2000

Mr. Stephen McCracken, Project Manager
Weldon Spring Site- DOE, 7295 Hway 94 South
St. Charles MO 63304

Dear Mr. McCracken,

We are concerned that the DOE is not planning to test ways to reduce potential hazards from the radioactive and hazardous waste that continue to contaminate groundwater at the Weldon Spring site. We have been informed that DOE does not plan to cleanup and treat this contaminated groundwater which empties into the river upstream from intakes for drinking water for St.Louis City and Country and for St. Charles County.

We hope that DOE will review this situation and alter its proposal to leave the radioactive groundwater without treatment, a policy that is opposed by the Missouri Department of Natural Resources.

In an area where large populations depend on sources of their drinking water and where there is high recreational use of this water, it is crucial that every effort be made to ensure its safety. Chronic low levels of radioactivity certainly will be detrimental to long term health and safety of individuals in this area and it is imperative that as much as possible be done to rid the groundwater of its present contaminants.

Thank you for your attention to this matter and we urge the DOE to reduce hazards from the Weldon Spring groundwater.

Sincerely,

Milton Schlesinger

Milton Schlesinger, Ph.D. Prof.Emeritus, Washington U.

Sondra Schlesinger

Sondra Schlesinger, Ph.D. Professor, Dept. Mol. Microbiology, Washington U.

024588

AUG - 8 2000

C. Savage

Missouri Coalition for the Environment

4287 Delmar Boulevard, 2-E, Saint Louis, Missouri 63130 (314) 727-0600 Fax: (314) 727-1665
Email: rovh@moenviron.org Webpage: http://www.moenviron.org

August 10, 2000

Mr. Steve McCracken
Project Manager
DOE Weldon Spring Site
7295 Highway 94 South
St. Charles, MO. 63304

Comments on Weldon Spring Site Groundwater Operable Unit

The Missouri Coalition for the Environment is extremely concerned that the Department of Energy is proposing to complete its remedial actions at the Weldon Spring Site without cleaning up the contaminated aquifer below the Site of radioactive and chemical contamination. We firmly believe the remedial project should not end until all areas of contamination are stabilized or treated and acceptable long term stewardship plans have been developed.

The Department of Energy (DOE) has been working on cleaning up and containing the radioactive and chemical wastes left at the Weldon Spring Site in St. Charles County. Having spent such a considerable amount of time and money (the estimate of the total cost of the remedial projects when finished is close to one billion dollars) we believe that it does not make sense for DOE to end the project without having contained and stabilized all the wastes, including those which have migrated into the groundwater.

The groundwater system under the Weldon Spring Site is acknowledged to be a potentially usable potable aquifer by DOE, the Environmental Protection Agency (EPA), and the Missouri Department of Natural Resources (MDNR). The MDNR, which is responsible for protecting the waters of the state, has objected to the proposed Groundwater Remedial Action Plan as inadequate. We concur that the proposed Plan is inadequate if it does not result in the groundwater being cleaned up of all contaminant parameters.

The Coalition urges that the DOE fully characterize the extent of groundwater contamination and accurately determine the amount of contamination that could be removed from the aquifer. The Doe should fully explore all feasible methods of cleaning up the subsurface and surface waters on the Site and in the immediate vicinity. This should be done for all contaminants of concern: long-lived radionuclides, particularly uranium, explosives wastes (nitroaromatics), and nitrates, in addition to the proposed clean up of the solvent TCE.

The MDNR has pointed out that the DOE has inappropriately waived certain standards used to guide hazardous waste remedial actions, namely "applicable or relevant and appropriate requirements" or ARARs for uranium, 2,4-DNT, and nitrates. These ARARs should be determined and used to guide the groundwater remedial action.

The DOE has not established a sufficient monitoring system for the waste disposal bunker or its possible impacts to the groundwater system. In addition, the DOE has not delineated an adequate, long term system of institutional controls to protect public health and safety and the environment. These concerns must be addressed by the DOE as part of the Remedial Action Plan. The radioactive wastes stored in the bunker will be giving off dangerous radiation for many thousands of years and present and future generations should be protected from the Site's adverse impacts caused by failure of the bunker to contain the wastes or inadvertent intrusion into the Site.

Any program of long term monitoring and stewardship must also address the question of cost and responsibility. The DOE must indicate clearly who will be responsible for the Site and where the money for long term monitoring and stewardship will come from.

Thank you for the opportunity to comment.

Sincerely,

Roy C. Hengerson

Roy C. Hengerson
Environmental Policy Director

Mr. Stephen McCracken, Project Manager
7295 Hwy 94 South
St. Charles, Mo. 63304

Dear Sir:

I read the article in the Post by Kay Drey.

I had known in the past about the contaminated water in St. Charles county when my son and his family moved to St. Peters.

I think it is deposable that this contaminated ground water has not been treated. I do not want any child or adult to drink this water since it is easily treated. Please, I beg you to help with the clean up as it will affect many generations to come

Sincerely

Nancy Burr
2516 Bremerton R
Brentwood, MO. 631

Nancy G Burris
2516 Bremerton Rd
Brentwood MO 63144-2204

33USA

Mr. Stephen McCracken, Project manager
Weldon Spring Site - DOE
7295 Hwy 94 South
St Charles, MO 63304

Dear Mr. Steven McCracken,

I am very disturbed at the knowledge that the groundwater at the Weldon Springs Superfund site has been contaminated and the DOE is currently not considering clean up at the site.

Residents of St. Louis County deserve to know that the drinking and tap water is free of lead, arsenic, uranium, or any of the other potential contaminants from industry.

We demand that these areas are completely cleaned and that the groundwater is tested for residual pollutants and contaminants, and then cleared up.

Please do not put the [redacted] health of our friends and families in danger. Clean up the water at the Weldon Springs site.

Sharon Smith
4366 Maryland Ave #105
St Louis MO 63108

Dear Mr. Steven McCracken,

I recently found out about contamination at Weldon Springs which as a Superfund site has contaminated water that is a drinking source for many in the St. Louis area. I applaud your efforts in cleaning up the contaminated soil, but if the groundwater is still contaminated with toxic chemicals and heavy metals. Please count this comment as you decide what to do about the water pollution by Weldon Springs. Thank you for your attention this issue.

Sincerely

Timothy Breeze
7261 Delmar Blvd
University City MO 63130
(314) 727 4109
tabreeze@yahoo.com

Dear Steven McCracken,

I have recently become aware of the pollution of the ~~[illegible]~~ ground water in the Weldon Springs area. I believe this is a situation that needs immediate attention. The people of St. Louis City and County deserve to have clean drinking water and therefore, action needs to be taken to insure that the Weldon Springs area is cleaned up.

Thank You,

Jim Williams
1002 Redemption Way
St Louis, MO 63139

Dear Mr. McCracken,

I am writing to urge you to do everything within your power to clean the contaminants that have yet to be expunged from the Weldon Spring Groundwater. Under the current plan the DOE proposes only to treat the groundwater with TCE. I am deeply concerned that the plan does not include the treatment for the radioactive contamination (Uranium) or the explosive waste in the groundwater.

Please consider the importance of this water source to the Missouri community. I for one don't wish to increase my chances of getting cancer.

Sincerely,

Andrew Nelson

9-11-00

Mr. Steven McCracken,

I am appalled by the extensive [illegible] of groundwater in [illegible] Missouri. This pollution may have dramatic repercussions on [illegible] and [illegible] effecting [illegible] and human drinking water. Thus, I strongly [illegible] you to clean up this [illegible] [illegible] and [illegible] it [illegible]

Sincerely,

[illegible]

Elizabeth [illegible]
[illegible] Parkway
[illegible], MO [illegible]
[illegible]

Aug 1, 2000

Dear Mr. McCracken

I am writing to encourage you to clean up the ground water of Weldon Springs. As a new arrival to Missouri, clean water is very important to me and an issue I've worked on for the past 5 years. Polluted water does more than just contaminate the environment, it can cause many and severe health effects in people.

I strongly encourage you to do what it takes to stop pollution and clean up the water supply in Weldon Springs

Sincerely,

[illegible]

Tom Bankledge
59 Lear Maryland Place
St. Louis MO 63108

PARIS
Centre National d'Art et de Culture
Georges Pompidou.
Architectes: Renzo Piano et Richard Rogers

SAINT LOUIS MO 53
PM
AUG
2000

Jean and David Weinstock
7731 Lacom Court
Saint Louis, MO 63121

Editions du GLOBE - PARIS
10, rue St Marc - Tél. 01.42.36.41.28 - Rep. int.

Dear Mr. McCracken
Please do not abandon your Weldon Spring Superfund site until you have cleaned up the groundwater. We appeal to you on behalf of our children and grandchildren.
Sincerely,
Jean and David Weinstock
Normandy, MO

Photo : Y. ARO

Stephen McCracken
Weldon Spring Site
Remedial Action Project Off.
7295 Highway 94 South
St Charles, MO 63304

024599

AUG 11 2000

August , 2000

Mr. Stephen McCracken, Project Manager
Weldon Spring Site - Department of Energy
7295 Highway 94 South
St. Charles, Mo. 63304
Fax 1-636-447-0739

Re: Clean up of Weldon Spring Radioactive Groundwater

Dear Mr.McCracken:

I am writing as a concerned citizen, requesting that clean-up efforts at Weldon Spring include clean-up of the groundwater to safe drinking water standards.

It is my understanding that DOE is proposing to only treat the groundwater for trichloroethylene (TCE) with no guarantee that this will be continued until acceptable standards are reached. Also, DOE proposed NO treatment for the radioactive contamination (uranium) or the explosives waste in the aquifer. I understand that technologies are available that can remove much of the radioactive and hazardous waste from the groundwater. I consider it essential that these current technologies be applied to eliminate the hazards at this site.

Sincerely,

Margaret Stacy Gaal
1126 Childress
St. Louis, Mo
63139

024598

AUG 1 1 2000

Mr. Stephen McCracken
Project Manager
Weldon Springs Site-DOE
7295 Highway 94 South
St. Charles, MO 63304

To whom it may concern,

I write this letter to urge that the cleanup of groundwater at Weldon Springs be a COMPLETE cleanup. This site is adjacent to the Missouri river, atop a karst landscape, and we are told that the radioactive and other types of contamination may not be cleaned up. This is ridiculous and inexcusable. It is reckless and dangerous. The outcome could easily be the irreversible contamination of drinking water for St. Louis, both city and county, and everyone else down the line.

Use some sense and clean this up. And clean it up right. (That means all of it.)

Adamantly yours,

Jim Scheff
20 Crabapple Ct.
St. Louis, Mo 63132

024597

AUG 1 1 2000

FROM 636 441 8387
BALDING - AUG 13, 2000

MR STEPHEN H. McCRACKEN, PROJECT MANAGER
WELDON SPRING SITE REMEDIAL ACTION PROJECT
7295 HIGHWAY 94 SOUTH
SAINT CHARLES, MISSOURI 63304

FAX 636-447-0739

DEAR MR McCRACKEN,

I WRITE TO ENCOURAGE YOU NOT TO ABANDON THE WELDON SPRING CLEAN-UP PROJECT. I UNDERSTAND FROM THE WELDON SPRING SITE REMEDIAL ACTION REPORT THE INTENTION IS TO LEAVE THE HAZARDOUS WASTE MATERIAL IN A PILE BEHIND THE SCHOOL. I AM NO GEOLOGIST, BUT HAVE SERIOUS CONCERNS ABOUT THE VALUE OF THE KARST SUBSOIL AS A REAL BARRIER TO LEACHING HARMFUL CHEMICALS INTO THE GROUND WATER.

I LIVE ONLY A FEW MILES DOWNSTREAM. THERE ARE 6 OR MORE SPRING FED CREEKS FLOWING THROUGH OURS AND THE NEIGHBORING FARMS — SEVERAL SMALL PONDS AND SWAMPY AREAS. WE GET OUR HOUSEHOLD, DRINKING AND LIVESTOCK WATER FROM WELLS ON THE FARM, AS DO MOST OF OUR NEIGHBORS. HUNDREDS OF PEOPLE IN THIS AREA COULD BE EFFECTED, AS WELL AS THE MANY MEMBERS AND GUESTS IN THE STRATHALBYN FARMS CLUB

THANK YOU FOR CONSIDERING THIS REQUEST.

SINCERELY,

Laura C. Balding

LAURA CARPENTER BALDING
6 WOLFRAM RD.
ST. CHARLES, MO 63304
FAX / PHONE (636) 441-8387

FACSIMILE

TO: FAX: 1-636-447-0739
Mr. Stephen McCracken, Project Manager
Weldon Spring Site - DOE
7295 Highway 94 South
St. Charles, MO 63304

FROM: Daniel W. McKeel, Jr., M.D.
5587-C Waterman Blvd.
St. Louis, MO 63112
Phone: 314-367-8888
Fax: 314-367-7663
E-mail: dan@wubios.wustl.edu

DATE: August 13, 2000

SUBJECT: Groundwater cleanup at Weldon Spring DOE site

MESSAGE

Please consider my attached comments advocating further remediation of contaminated ground water at the St. Charles County Weldon Springs DOE site. My concerns are those of a citizen and a Missouri physician. I believe the potential hazards posed to the public merit the utmost adherence to the principles of honesty, full disclosure of the data, and adequate time to make comments on the part of DOE in responding Missouri citizens who have a vital interest in the ultimate resolution of this matter. For many of us, the risks of "just walking away" are totally unacceptable given the not well defined but potentially high risks posed by the radioactivity in our drinking water supply.

I therefore urged extending the public comment period on this vital matter another six months and was happy to see the deadline for public commentary extended to August 14, 2000.

Most Sincerely,

Daniel W McKeel Jr MD

Daniel W. McKeel, Jr.M.D. 8/13/00

Daniel W. McKeel, Jr., M.D.
5587-C Waterman Blvd.
St. Louis, MO 63112

August 13, 2000

Mr. Stephen McCracken, Project Manager
Weldon Spring Site - DOE
7295 Highway 94 South
St. Charles, MO 63304

Dear Mr. McCracken:

I am writing to you as a physician to urge your reconsideration of not doing further remediation of radioactively contaminated ground and aquifer water at the Weldon Springs DOE site in St. Charles county. I am dismayed this contaminated water will continue to be dumped into the source rivers for St. Louis drinking water, St Charles aquifers and wells, and bodies of water that are used for recreation and therefore will lead to direct exposure of Missouri citizens. This factor alone should be sufficient to weight your cost-benefit analysis sharply on the side of eliminating all possible radioactive contamination instead of the easier to accomplish, less costly, but more dangerous to humans standard of "impracticability." I would urge you to give strong consideration to Missouri agencies and environmental groups who strongly oppose leaving the contaminated water "as is" at Weldon Spring. From a medical point of view, it seems clear that leaving traces of uranium, plutonium, thorium, TNT and other toxic chemical in aquifers that feed wells owned by citizens is not only unacceptably dangerous but extremely unwise and "pound foolish" in light of the large amounts of money already spent on cleanup efforts at the site. There seems to be widespread appreciation in the community of the thorough cleanup job carried out thus far at Weldon Springs.

The certainty of increasing risk for human exposure to radiation damage should raise the bar with regard to your ultimate goal. Some more specific reasons that I am concerned are outlined below.

It is my understanding that the reasons DOE has stated for <u>not doing further ground water remediation at the Weldon Springs site</u> include engineering impracticality, cleanup is not "cost-effective", and questionable permanence. I understand the EPA agrees with your current position but that MO DNR is opposed, a position I strongly support. I would like to express my concerns partly as a Missouri citizen (31 years residence) who uses the trails and river recreational areas of the affected area. My major concerns, however, arise as a physician and anatomic pathologist on the faculty of Washington University School of Medicine in St. Louis since 1974. I now direct the Alzheimer's Neuropathology Core laboratory of our Alzheimer Center, and am well aware of the effects radiation has on the central nervous system. I directed the Autopsy Pathology Service at WUSM for 7 years and have a long standing professional interest in the many adverse effects of ionizing radiation on the human body and of thorium on the central nervous system. Specifically, I am aware of the data concerning excess mortality in former Mallinkrodt Chemical Works workers contained in the EPA's CEDR 1999 catalog, dataset MCD94A01, found on pp. B55-B57. I am aware of additional more recent NIOSH medical followup studies on these MCW workers. Although there has been extensive cleanup, it is these same proven dangerous-to-human-health radioactive and toxic residues you admit remain in the local water supply, albeit at relatively low levels. The issue of a "threshold" dose below which radiation is 100% safe is not settled as you know. Until it is, I would argue that DOE must undertake <u>every possible effort</u> to clear the water supply around Weldon Springs, regardless of the costs that are already immense.

I also implore you to fully disclose the entire extent of the residual water contamination at the site with maps and radiation measurement data, in a form that is readily available to the public. Preferably, this information should be free. I would like a copy of any information on this issue that is currently available to the public.

Sincerely,

D.W. McKeel, Jr. M.D.

Daniel W. McKeel, Jr., M.D.
Associate Professor of Pathology and Immunology
Washington University School of Medicine

U. Savage

August 14, 2000

Mr. Stephen McCracken, Project Manager
Weldon Spring Site - Department of Energy
7295 Highway 94 South
St. Charles, Mo. 63304
Fax 1-636-447-0739

Re: Clean up of Weldon Spring Radioactive Groundwater

Dear Mr.McCracken:

I am writing as a concerned citizen, requesting that clean-up efforts at Weldon Spring include clean-up of the groundwater to safe drinking water standards.

It is my understanding that DOE is proposing to only treat the groundwater for trichloroethylene (TCE) with no guarantee that this will be continued until acceptable standards are reached. Also, DOE proposed NO treatment for the radioactive contamination (uranium) or the explosives waste in the aquifer. I understand that technologies are available that can remove much of the radioactive and hazardous waste from the groundwater. I consider it essential that these current technologies be applied to eliminate the hazards at this site.

Sincerely,

Nikki L Burton

C-Hvage

August 11, 2000

Mr. Stephen McCracken, Project Mgr
Weldon Spring Site Remedial Action Project Office
7295 Hwy. 94 South
St. Charles, MO 63304

Dear Mr. McCracken:

I urge you please NOT to conclude remedial efforts by the DOE at Weldon Spring until the groundwater is completely cleaned up of all contamination. The DOE must guarantee to continue treatment of groundwater for TCE until levels are reduced to acceptable standards. There must be treatment for the radioactive contamination (uranium) or explosive waste in the aquifer.

Thank you.

Daniel F. Havens

Daniel F. Havens, concerned citizen
8401 Cornell Ave.
St. Louis, MO 63132

C. McCracken

Aug. 11, 2000

Dear Mr. McCracken:

I do not understand why the Weldon Spring site may not be completely cleaned up. Why won't the DOE guarantee that TCE levels will be reduced to acceptable standards? Why won't they treat the radioactive contamination or explosive wastes in the aquifer? The DOE should <u>not</u> end their work at Weldon Springs until the job is done!

Sincerely,

Marilyn Lipman
122 Plantation Dr.
Creve Coeur, MO 63141

Cassandra

August , 2000

Mr. Stephen McCracken, Project Manager
Weldon Spring Site - Department of Energy
7295 Highway 94 South
St. Charles, Mo. 63304
Fax 1-636-447-0739

Re: Clean up of Weldon Spring Radioactive Groundwater

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Sincerely,

Susan Klarfeld

Susan Klarfeld
333 Falaise Dr.
St. Louis MO. 63141

024616

AUG 14 2000

Cassandra

12 Aug 00

Stephen McCracken, Project Mgr
Weldon Springs Site
Remedial Action Project Office
7295 Hwy 94 South
St Charles, Mo 63304

I just read that the DOE is considering leaving unfinished the clean-up of the Weldon Springs Superfund site without making the ground water meet standards for drinking water. By doing so, you will be leaving a hazardous legacy for future generations. No time is better than NOW to clean up all sources of contamination in the groundwater until drinking water standards are met. It will never cost less to delay. DO IT!

Sincerely
M. M. KLEBA
ST LOUIS MO

3929 GUELINE AVE

024617
AUG 14 2000

C. Storage

8-14-2000

Dear Mr. McCracken,

I request that clean-up efforts at Weldon Springs include clean-up of the groundwater to safe drinking water standards.

Sincerely,

Cynthia C. Lambsley
229 W. Jewel Ave.
Kirkwood Mo.
63122

Cassandra

Becky Denney
625 Angenette Ave.
Kirkwood, MO 63122-6220
314-821-5524

August 11, 2000
Re: Weldon Spring Groundwater Operable Unit

Stephen McCracken
Project Manager, Weldon Spring Site - DOE
7295 Highway 94 South
St. Charles, MO 63304

Dear Sir:

I wrote you a letter July 11 in which I stated that the cleanup of the Weldon Spring Chemical Plant site should include cleanup of the groundwater. It is critical that future inhabitants and users of this area are alerted to what has been done here and what cleanup is still undone. After further research, I believe the safety of St. Charles County inhabitants, the users of the conservation areas and the Katy Trail, and the wildlife in the area will be at risk if the radioactivity and hazardous waste is not removed from the groundwater.

Study and treatment of groundwater is becoming an important issue as greater numbers of Americans are affected by contaminated water.[1] In 1939 the Minnesota Department of Health, Manual of Water Supply Sanitation read: "There is a common belief that contamination may seep through the soil for long distances and get into a well in this way, but such is not generally true in Minnesota although it should always be considered a possibility."[2] 11 cases of typhoid fever and 1 death in southeast Minnesota (Olmsted County)changed their thinking and the actions of putting sewerage in sinkholes. It took 4 hours for a dye travel from the village sinkhole to the farm well in question and another well and a shallow municipal well showed contamination although not the dye. "As these Minnesotans discovered, water can travel quickly through the subsurface in southeastern Minnesota and may not be purified along the way."[3]

This area of Minnesota is an example of a karst area with lots of sinkholes, and thin soil where the bedrock is limestone.

In 1983 when county official realized they needed a new landfill they used a map (Olmsted County Geologic Atlas) put out by the Minnesota Geological Survey to find a site that would not contaminate the groundwater. "An acceptable site was required to have (1) depth to bedrock greater than 100 feet; (2) absence of karst features in the site area and contiguous 160-acre parcels; and (3) presence of an

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effective confining layer above any aquifer system that might be used for drinking water. To find the ideal site took citizen input and education as well as geologic information.

Now the city of Rochester, also in Olmsted county, is growing and has lots of construction which may be in an area that will affect the aquifer that furnishes their drinking water. The information needed has become more complex and the solutions more critical. The author is optimistic about the outcome for Rochester because of citizen education and involvement as well as cooperation between scientists and policy makers. [4]

The Weldon Spring Chemical Plant was built on a ridge that we know is a surface-water divide for the Missouri River and the Mississippi River basin. This surface water has been flowing into Dardenne Creek watershed and also south into the Missouri River during the time the Ordnance plant was working in Nov. 1941 to 1955. Then with the establishment of the WSCP the surface water has been flowing from contaminated buildings, sludge from raffinate pits, from contaminated dumps, coal storage area, and chemical containers from the uranium processing plant into the ground and into vicinity creeks and lakes during the time it was established and working (1957 to 1966) to nearly the present. There has been contamination in various parts of that original 17,232 acreage (WSOW) for about 60 years with long term contamination (uranium processing)actually from the area of the ridge (217 acre plant WSCP) for over 40 years.[5]

The bedrock in the area of the WSCP & vicinity is "undifferentiated Mississippian rocks of the Burlington and Keokuk Limestones." [6] An area with such a bedrock frequently has springs and is called a karst area. This area doesn't have the large springs and frequent sinkholes of the Salem plateau further south in Missouri but the groundwater does flow in an unpredictable manner. [7] Uranium processing contamination and other pollutants have been entering the groundwater in the area for 43 years. The recharge time for a spring in karst is often fairly fast but there may be fractures and solution cavities where there are pockets of contamination due to the capture of small particles and colloidal suspension .

Burgermeister Spring and the creek into which it drains have been a favorite place of mine for years. I startled deer there and watched turkeys fly into the trees. Every spring for years I enjoyed the clear, cool spring water and the large beds of jonquils in a seemingly wild place. I didn't know the name but envisioned that earlier residents must have loved their life there. I took my puppies there to wade in the

water and also my children. For years there was nothing to tell me it was anything other than a lovely Missouri spring.

Today the Burgermeister Spring branch is cloudy. But the spring itself is clear as water spiders and other bugs skitter across the top of the water. I followed the unnamed creek and then up the spring branch to reach it, not my usual path but there was a well cut trail and brush & vines had grown up all around from other directions. I could see the large old trees that had fallen and also some old trees still standing but didn't venture into the thick brush. A meadowlark sang from a nearby field, a small animal rustled the leaves as he dashed away from me. The foundation that surrounds the spring is still in good shape and I can stand on it to enjoy or study the spring. I watched & tried to count all the little places where the sand whirled around as the spring bubbled up. I don't remember seeing so many little swirls so clearly as the spring rises but it's been some time since I've been there.

Later I realized I did enjoy seeing the spring even though I know it's polluted. I'm used to seeing the monitoring box near the spring. Although, the *first time* I saw it, I was alarmed.

> But, the idea that we human beings are so irresponsible with such toxic substances! It's one thing to make them for the enemy. It's quite another to leave them right here in our midst.

The water from Burgermeister Spring has been shown to contain contaminants such as sodium, chloride, nitrite plus nitrate, lithium and uranium. [8] The concentrations of sodium and chloride may be from a subsurface connection between the spring and an east tributary of Schote Creek which contained a road-salt storage facility. "Increased concentrations of nitrite plus nitrate, lithium, and small quantities of uranium at base flow are the result of seepage from the raffinate pits (predominately raffinate pits 3 and 4) migrating through preferential pathways within bedrock troughs extending northward from the raffinate pit area to Burgermeister spring. Concentrations of uranium tended to increase at larger flows because runoff that contained large concentrations of uranium (from Ash pond) entered the east fork of the west tributary of Schote Creek."[9]

There are recent studies of groundwater contamination in other karst areas in the St. Louis area. These are in the Illinois counties of Monroe & St. Clair in southwest Illinois near the Mississippi River :

"The karst terrains of Illinois and Missouri [10] include numerous groundwater basins whose karst aquifers are open systems with water levels that are typically about 10 m below the soil-bedrock interface. The distal end of a groundwater basin is characterized by one or more springs that discharge to, and generally are the headwaters of, surface streams, which in this area ultimately discharge to the Mississippi River."[11]

Springs in the WSCP area indicates a karst topography but without abundant sink holes the recharge probably takes longer than the karst found in Illinois counties of Monroe and St. Clair or north St. Louis. This description of *karst aquifer* from the Illinois studies describes the complexity of groundwater drainage :

"The term 'karst aquifer' may be more pertinent to the problems of groundwater contamination associated with karst bedrock. Karst aquifers have an interconnected secondary porosity (crevices and dilated bedding planes) with apertures of a few millimeters to a few centimeters or more (USEPA, 1998) through which groundwater flows. However, groundwater flowing through karst aquifers does not behave in a predictable manner due to the bedrocks' complex geometry of wide apertures and the resulting turbulent flow."[12]

In a case of a limited spill or short-term contamination such as a barrel of pollutants that enters a sinkhole in a rainstorm, the pollution might be confined to a shallow aquifer and the contamination limited. There might be some hope that much of the groundwater contamination at Weldon Spring Chemical Plant even after 43 years is in a shallow aquifer. [13] The work that has been done at the site in the last decade and the wells that have been drilled all contribute to a truly disturbed site which has affected the groundwater. With the different kinds of material the groundwater may contain various sizes of particles not all of which will not flow readily through the bedrock. Testing should be done so we really do know where the contamination is located. But unless we treat the groundwater, radioactivity may be leeching through the groundwater forever.

It was hypothesized in the Illinois study that contamination would be stratified:

"However, contaminants in shallow groundwater, at least in southwestern Illinois, appear to be stratified with the greatest contamination being found at the shallowest depths. Stratification of nitrate, for example, is known to occur in the karst region of northeastern Iowa (Glanville, 1985). Well boreholes open

to the upper part of the karst bedrock, a zone where soil and bedrock intermingle (the epikarst), allow shallow groundwater to migrate through the larger conduits in the shallow bedrock and enter the wells (Figure 3). This construction practice commonly results in the mixing of contaminated shallow groundwater with uncontaminated groundwater from deeper in the bedrock. Observations in outcrops and nearby quarries (by the authors) suggest that solution-enlarged fissures and conduits are common in at least the upper 20 meters of bedrock."[14]

The studies that were done in the Illinois counties were done to protect the drinking water from fecal contamination from improperly working septic systems[15] and industrial contamination[16] so their situation was different from our site at WSCP but they came up with a reason for the contamination of the deeper aquifers:

"This seasonal variation probably is due to the increased biological activity in surface and near-surface waters that occurs during the warmer months (Geldreich, 1996), and rapid infiltration of contaminated surface waters due to karst features. The seasonal nature of the bacterial contamination of well water suggests that contaminated surface water is entering the shallow karst aquifer due, in part, to well construction practices (due to infiltration of shallow contaminated water around well casings)."[17]

They also came up with a method they thought might prevent contamination as long as the wells are drilled into the deeper aquifer:

"...Hazardous constituents are generally surface-derived contaminants associated with the shallow part of the karst aquifer. One possible means of reducing the occurrence of contaminants in a well is to case and grout a well for a depth of at least 30 m.This technique, in theory, should place the water intake well below the most contaminated part of the karst aquifer....We suggest that well owners check their water for bacterial contamination once a year, preferably during the spring and summer months when the potential for bacterial contamination may be highest.Nitrate concentrations rarely fluctuated more than one milligrams per liter when sampled on a seasonal basis over the course of two years. Consequently, little seasonal or annual fluctuation in nitrate concentrations in well water should be expected. However, this conclusion is based on limited data. Well owners with small children should have their water sampled annually for nitrate...."[18]

Like St. Charles County these Illinois counties are growing rapidly. In a county where there are young children, pregnant women, and older folks, as well as folks that are healthy and in the prime of life, water quality becomes a vital issue.

"The demand for good quality water is increasing in the study area...Land use is beginning to shift from rural agricultural to residential, resulting in increased groundwater use and protection problems and raising questions regarding proper disposal of septic waste. A better understanding of the degree, extent, and underlying causes of the water quality problems is vital because of the potential for further growth and increased water use in the study area."[19]

In an area such as St. Charles county any effort we make to alleviate risk of water contamination is worthwhile. I also toured the remediation site, quarry, and well field site today. So much of the contaminated material has been moved and put into one place for which I am thankful. But there is still great risk for some of the population as they live or move about in the area. I am not talking about a mathematical risk or a price tag. I'm talking about the moments of someone's life. I feel you still have work to do. We think about the Ozarks or the Current River as being priceless to our state. But here, with a growing population, growing industry & commerce, water that will not cause disease when we drink is truly valuable.

Just how much does the radioactivity in this water affect us? Does it affect some of us and not others? How safe is this water?

The safety of radioactivity and of x-rays has been studied and questioned since early in the 1950s. Well-trained, well-informed scientists have changed their minds through the years.

The Oxford Survey by Alice Stewart, David Hewitt, & J.W. Webb was first published in Lancet in 1956. They published a fuller report in the British Medical Journal in July 1958.[20]

"We could see it quite early on, from the first thirty-five pairs: *yes* was turning up three times for every dead child to once for every live child, for the question, 'had you had an obstetric x-ray?' *Yes was running three to one.* It was an astonishing difference. It was a shocker. They were as like as two peas in a pod, the living and the dead; they were alike in all respects except on that score. And the dose was very small,

very brief, a single diagnostic x-ray, a tiny fraction of the radiation exposure considered safe, and it wasn't repeated. It was enough to almost double the risk of an early cancer death."[21]

Their study was not well received so they kept on collecting data:

"We reckoned that a child a week was dying from this practice, which wasn't all that many--though any death caused by a medical practice is very much the wrong side of the tally. We thought that doctors would stop x-raying on the mere suspicion that we were right, and we felt we must hurry to cover all the deaths that occurred in the next ten years, because once they stopped x-raying, there would be no further cases. We needn't have worried; they went right on x-raying, so we went right on monitoring. We went on and on and managed to include all children who died from 1953 onwards. It was a full-time job and kept me close to the data collecting. We spent the next twenty years proving we were right, and we did prove it--that a single x-ray, a fraction of a permissible exposure, was enough to double the chance of an early cancer. We emerged after twenty years with a genuine finding--there could be no mistake."[22]

A 1960 study by Richard Doll and William Court-Brown in association with A. Bradford Hill " came to conclusions that corroborated the findings of the A-bomb studies--cancer risk could be extrapolated from high to low dose and there was effectively no risk at low dose."[23]

Because of the Court-Brown-Doll study many ignored the Stewart et al study: "So small and truncated a study as this was bound to have negative findings. It was outrageous how much influence it had! It got top billing--the *British Medical Journal* made it the lead article and give it an editorial. It shaped the way people perceived us in the coming years. Now everyone breathed a sign of relief and returned to their usual practices. Doctors went back to using prenatal x-rays."[24]

But a study done by Brian Mac Mahon in 1962 in New England corroborated the Oxford Survey results:

"It was much better designed than the British study. It took a larger sample and didn't confine itself to leukemia, and sure enough, it showed that the fetus was as vulnerable to x-rays as we'd said. And it was a prospective study, so it got official

approval. But MacMahon could only find this prospectively because he knew what to look for--*because our study had told him what to look for*. Otherwise, a prospective study would have had to have been *huge* to find what we found."[25]

Dr. Karl Morgan, a physicist at the Manhattan Project and Director of Health Physics at Oak Ridge National Laboratory from the late 1940s to retirement in 1972 says about Alice Stewart, "In time there is no question that she will be held up as one of the greatest epidemiologists of our century."[26].

Dr. John Gofman was the Medical chief of the Lawrence Livermore Lab and later the first head of Livermore's Bio-Medical Division. "Along with Glenn Seaborg Gofman codiscovered uranium-233, and he also was the first one to isolate plutonium"[27] Dr. Gofman calls Alice " the grand dame of radiation health science." "She's prevented untold numbers of premature deaths from miserable diseases like leukemia and cancer, and all history will owe her a great debt."[28]

When Alice Stewart was 68 and officially retired Dr. Thomas Mancuso asked her to assist him on a study commissioned by the AEC. It was to study the "biological effects, if any, of low-level ionizing radiation among workers employed in atomic energy facilities."[29] From this Alice Stewart and Geroge Kneale eventually published "Pre-cancers and Liability to Other Diseases." [30] "...'Our Hanford studies show that the odds against the mutation developing into a cancer are very high when you're about twenty, but that they decrease with age and the weakening of the immune system--the age effect again.'"(Greene, 238.)[31]

So, there are some scientists who feel that radiation can be more dangerous to certain age groups such as unborn babies and then again to folks once they are over 40 and even more dangerous after age 50.

There is also disagreement over the *threshold hypothesis*.[32] "Dr. Karl Morgan was the first U.S. government scientist to understand the implications of the Oxford Survey, and his understanding made for a conversion in his thinking about radiation risk."[33]

Dr. Morgan admited "Much of my time at the University of Chicago involved efforts to find and develop methods to prevent radiation exposure and to determine what would be a 'save' level of exposure. Little did I suspect that there is no 'safe'

level of exposure to radiation. I also attempted to estimate the types and extent of chronic injury that might be expected from a given exposure."[34]

Dr. Gofman in his testimony in the Karen Silkman trial in 1979 said that in the radiation field the safe standards are set on "nothing but thin air and guesswork."[35]

The area to the south of the WSCP, and down Highway 94 is quite beautiful and picturesqe, and there will be more and more pressure to develop any land that is not already designated state conservation area. The concentration of population will increase as land use changes. This is also true of any land that is North or West in this part of the Dardenne Creek watershed. The immediate vicincity is state conservation area so will not actually become high density living quarters but is becoming more and more a high use area for St. Louis and St. Charles residents of all ages.

Weldon Spring Conservation Area and Busch Conservation Area will become more and more *the reservoir* for wildlife populations for both woodland & grassland species in this part of the county. The attraction of waterfowl to the area is already obvious. The connection to the Missouri River corridor adds to its importance as a genetic reservoir for any biodiversity that St. Charles and western St. Louis County will have in the future.

Most people think of waterfowl or wildlife habitat as a *quality of life issue*. It's marvelous to be able to show your family nature within close driving distance of home or to spend time out-of-doors with an abundance of both plants and animals. If that's all these areas are then they may be *population sinks* and will draw waterflowl and other wildlife from other breeding populations. But the MO Conservation Dept works hard to make these habitat areas large enough and diverse enough so some of the native fauna and flora on these areas are breeding populations which are valuable *breeding sources*. In this case the wildlife & waterflowl in these areas make a *long-term contribution* to the genetic population as well as maintain their species numbers. How does this contaminated water affect these animals and their offspring? Does it affect some and not others? Can it affect their genes? How many generations have been studied?

Re: Weldon Spring Groundwater Operable Unit
Stephen McCracken, Project Manager, Weldon Spring Site-DOE

The book about Alice Stewart is very exciting because her theories give us hope that we can learn what contaminents cause disease and in what situations. Preventive medicine is still in its very beginnings so we will know much more in years to come. It is sadly true that when we accept hypotheses and conclusions, we close our minds to other possibilities. Alice says "it takes about twenty years. It usually takes that long for an unpopular discovery to be digested, and you're lucky if it takes *only* that long."[36]

Some background radiation is said to be natural so how important is it really to cleanup all the radiation at the WSCS? I think we need to be responsible and decrease any background radiation that we added to the environment in an area with a large and growing population. There are still too many questions about the effect of radiation on various age levels of our population.[37] To quote Alice Stewart again "you must on no account put up the level of background radiation. . . . It is no longer possible to defend nuclear power by saying, 'Well, we're only adding a fraction to background radiation.' You must not add *anything*!" [38]

Thank you,
Becky Denny
dardenne@swbell.net

Re: Weldon Spring Groundwater Operable Unit
Stephen McCracken, Project Manager, Weldon Spring Site-DOE

1. The MO Dept of Natural Resources has set up web pages so we have access to information we need for planning water use for both surface water and ground water. See MO Dept of Natural Resources, Water Resources Program, http://www.dnr.state.mo.us/dgls/wrp/swp.htm

2. This area of southeastern MN has"...First, the bedrock strata exposed at the surface are carbonate rocks: limestone made primarily of the mineral calcite and a closely related rock called dolostone make primarily of the mineral dolomite. Groundwater seeping through cracks in carbonate rocks can dissolve mineral sin the rock to form a network of fractures, fissures, conduits, and sometimes caves..."Manduca, Cathryn A. Living with Karst:Maintaining a Clean Water Supply in Olmsted County, Minnesota, from *The Earth Around Us--Maintaining a Livable Planet*, Ed. By Jill . Schneiderman. New York, W.H. Freeman & Company, 2000. *269*.

3. "...The absence of a sediment blanket allows surface water to enter the carbonate rock more easily and promotes the development of karst. Where lack of protective cover and well-developed karst combine, southeastern Minnesota's water supplies are especially vulnerable to contamination."Manduca, *270*.

4. Manduca, *277-282*.

5. "The Weldon Spring Chemical plant site is located on a ridge that is a surface-water divide for the Missouri and Mississippi River Basins. The surface water draining north off the site flows into tributaries of Schote Creek, onto the August A. Busch Wildlife Area, then eventually into Dardenne Creek, which drains into the Mississippi River. The surface water draining to the south of the site flows into steep-gradient streams that drain directly into the Missouri River about 1.5 miles away." Kleeschulte, Michael J. And Pierce W. Cross, Hydrologic Data for the Weldon Spring Chemical Plant Site and Vicinity Property, St. Charles County, Missouri--1986-89. U.S. Geological Survey. Open-File Report 90-552, 3.

6. "The site is located along an east-west-trending ridge near the boundary of the Dissected Till Plains of the Central Lowland Province to the north and the Salem Plateau of the Ozark Plateaus to the south (fig.1). The ridge approximates the surface- and ground-water divides between the Mississippi River to the northeast and the Missouri River to the south (Kleeschulte and Emmett, 1986). The topography of

the site is characterized by a gently undulating surface of unconsolidated Quaternary glacial drift and loess deposited on weathered, undifferentiated Mississippian rocks of the Burlington and Cakewalk Limestones. Immediately to the south of the site near the Missouri River, the topography changes to one of steeply dipping slopes." Schumacher, John G. Geochemistry and Migration of Contaminants at the Weldon Spring Chemical Plant Site, St. Charles County, Missouri--1989-91. U.S. Geological Survey. Open-File Report 93-433, 6.

7. "The chemical-plant area is underlain by typically thin overburden deposits ranging from 9 to 55 feet thick. These deposits overlie a residuum layer ranging from 0 to 26 feet onsite; this residuum is characterized by cobbles and boulders of limestone and chert in a silty, sandy, clay matrix. These unconsolidated materials overlie the Keokuk and Burlington Limestones, which are cherty limestones that locally are fractured and contain solution channels. Springs, losing streams, solution cavities, and fractures exist both north and south of the Weldon Spring chemical plant site." Kleeschulte, Michael J. And Pierce W. Cross, 3.

8. Schumacher, 2.

9. Schumacher, 2.

10. "Bedrock in these counties consists predominantly of Mississippian limestone and dolomite, in addition to lesser amounts of Mississippian and Pennsylvanian limestone, sandstone, shale, claystone, and coal (fig.3b). In the western part of these counties, loess and residuum are mostly absent, and bedrock is exposed at and near the Mississippi River bluffs (Herzog etal. 1994). Where loess and residuum occur, they are typically less than 15m (50ft) thick, but they may be thicker in and near stream valleys (Piskin and Bergstrom 1975).Panno, S.V., I.G. Krapac, C.P. Weibel, and J.D. Bade Groundwater Contamination in Karst Terrain of Southwestern Illinois .Environmental Geology 151 1996. Illinois State Geological Survey. Page 4.

11. Panno, Samuel V. and C.Pius Weibel, Carol M. Wicks, and James E. Vandike Geology, Hydrogeology, and Water Quality of the Karst Regions of Southwestern

Illinois and Southeastern Missouri ISGS Guidebook 27 Geological Field Trip2: April 22-23, 1999 North-Central Section, Geological Society of America 33rd Annual Meeting, Champaign-Urbana, IL Page 4.

12. Panno, S.V., and C.P.Weibel Sources of Natural and Man-made Contaminants in Groundwater of Karst Regions of Illinois.. in Proceedings of the Groundwater Protection Field Day, Waterloo, IL May 14, 1999 P.49-51. Page 1.

13. "Groundwater flow rates in a karst aquifer are often measured in terms of meters per day to meters per second, whereas the groundwater flow rate in a porous medium such as sand and gravel, may be measured in meters or less per year. Thus, if sinkholes are present or if soil cover is relatively thin (less than or equal to 15 meters), underlying karst aquifers are capable of transporting infiltrating contaminants from point or nonpoint sources to wells and springs in a matter of hours or days."Panno and Weibel,1.

14. Panno, S.V., and C.P.Weibel, 2.

15. "The densest concentrations of karst features in the state are found in Monroe, Randolph, and St. Clair counties (fig. 2) (Weibel and Panno, in press). Concentrations of total coliform bacteria, fecal coliform bacteria, and nitrate (NO3-) in water samples collected from wells in Monroe and Randolph Counties frequently exceed U.S. Environmental Protection Agency (U.S. EPA) quality standards for drinking water. Trace concentrations of pesticides have also been also detected in water samples collected from residential wells and springs (Panno et al. 1995)." Panno, Krapac, Weibel, and Bade, 2.

16. "The source of sodium and chloride are many and include naturally-occurring salts that are dissolved in groundwater at relatively great depths in Illinois, road salt, landfills, livestock waste, and effluent from septic systems. Fractures in bedrock associated with geological structures, such as monoclines, anticlines and synclines (folds in bedrock), and faults may provide a pathway for deep, more saline groundwater to migrate to relatively shallow depths where it can affect the water quality of drilled wells."Panno and Weibel,4.

17. Panno, and Weibel, 5.

18 Panno & Weibel, 6-7.

19. Panno, Krapac, Weibel, and Bade, 6.

20. Alice Stewart et al., "Preliminary Communication: Malignant disease in Childhood and Diagnostic Irradiation *in utero*," *Lancet* 2 (1956): 447; "A Survey of Childhood Malignancies, " *British Medical Journal* I (28 June 1958) 1495-1508.

21. Greene, Gayle, *The Woman Who Knew Too Much Alice Stewart and the Secrets of Radiation*. Ann Arbor: The University of Michigan Press, 1999. Page 83.

22. Greene, 85-86.

23."The Court-Brown study was wrong on many counts,' explains Alice. 'It looked only at children who had been x-rayed and surveyed only eight hospital, which was too small a sample. It followed the children forward in time, but it didn't follow them as ong as it needed to, a fuliten years. Besides, it looked only for leukemia. Everyone was sure we were wrong about the other cancers because there was nothing in the A-bomb studies about any cancer other than leukemia, so they assumed they could limit their investigations to leukemia.But if you limit the field this way you're looking at only half the story, cutting down your chances of finding anything by a 50 percent. If you study only x-rayed children and then don't follow them the full ten years, you've limited yourself even further."Greene, 88.

24. Greene, 88.

25. Greene, 89.

26. Greene, 230.

27. Morgan, Karl Z. & Ken M.Peterson. *The Angry Genie: One Man's Walk through the Nuclear Age*. 1998: University of Oklahoma Press. Norman. 139.

28. Greene, 231.

29. Green, 113.

30. Green, 296.

31."There is another way that time features centrally in Alice and George's epidemiological surveys; it was George's method for testing sensitivity over time that enabled him to find the age effect in the Hanford data. 'If you understand this varying sensitivity of individuals to radiation over time, you find an age effect; if you don't, you don't,' explains Alice. George realizes that a dose is not a simple number but that its effect varies according to whether you're a fetus or a child, young or old, male or female, healthy or sick, well or badly nourished or weakened by previous exposures to radiation or chemicals. This is one of Alice's arguments with health physicists, whose calculations assume, for all practical purposes, that 'radiation hits cardboard." Health physicists concentrate on the dose a person receives but take no account of the varying responses of varying human beings."(Greene, 222.)

32. "*Linear hypothes*.As used in this book, one of three hypotheses regarding the development of cancer following exposure to ionizing radiation: the linear hypothesis, the threshold hypothesis, and the supralinear hypothesis. ...The threshold hypothesis assumes that there is no increase in cancer incidence in a population or in the risk to a person unless the dose exceeds a poorly defined threahold dose. This threshold is usually considerd to be one or two times the natural background dose or 100-200 mrem..." Morgan & Peterson, 201-202.

33. Greene, 90.

34. Morgan & Peterson, 21.

35. "Spence asked Gofman to comment on Paul's assurance in his opening statement that plutonium exposure inside the Kerr-McGee facility was within safety limits set by the AEC. Gofman replied that unfortunately when a new substance appears, the first thing industry wants to know is 'how much can we allow people to have'(769). 'And, I have to tell you, sadly, that in the radiation field, as well as in the chemical field, in the radiation field the safe standards are set on nothing but thin air and guesswork. And, I state that flatly as a conclusion' (769-70). Gofman supported his opinion by quoting a prominent member of the Nuclear Regulatory Commission, Robert Minogue, who had written to the commissioners stating, 'We should remove the term permissible because it is being misused to make workers think it is safe'(774)." (Morgan & Peterson, 141.)

36. Greene, 90.

37."Alice also maintains that the cancer effect of background radiation is stronger than that of prenatal x-rays, because it can affect the fetus within the first days of conception. It was 'lucky for the human race,' as she says, that obstetric x-rays were done in the last trimester of pregnancy, since the Oxford Survey showed that the earlier the exposure, the greater the risk. First trimester x-rays--which were fortunately rare--created a greater cancer risk than third trimeste exposures, whcih were more usual. E. A. Gilman, George Kneale, E.G. Knox, Alice Stewart, "Pregnancy X-rays and Childhood Cancers: Effects of Exposure Age and Radiation Dose," *Journal of Radiological Protection* 8, no.I (1988):3-9.

38.Greene, 196.

COPY

515 West Point Ave.
University City, MO 63130
September 1, 1999

Mr. Stephen H. McCracken, Project Manager
Weldon Spring Site Remedial Action Project Office
U.S. Department of Energy
7295 Highway 94 South
St. Charles MO 63304

Fax: 314-447-0739
Attn: Karen Reed

Dear Mr. McCracken:

Probably it was about ten years ago when a geologist responded to some of my concerns about the Weldon Spring contamination by saying: "The one thing you really have to worry about is that the Department of Energy (DOE) not be allowed to walk away from the site without cleaning up the groundwater to concentrations consistent with natural background." At the time I considered such a possibility to be preposterous.

And yet, having read the "Proposed Plan for Remedial Action for the Groundwater Operable Unit at the Chemical Plant Area of the Weldon Spring Site," July 1999, DOE/OR/21548-733, and many other documents about groundwater over the past 25 years, I am afraid that the DOE is proposing to do just that: to try to remove the chlorinated solvent/degreasing compound, trichloroethylene (TCE), from the raffinate pit area, and leave the rest of the groundwater contaminants to migrate wherever. (The page citations below will refer to the "Proposed Plan" unless otherwise noted.)

I do not criticize the decision to try to break down TCE, a known carcinogen, or the DOE's choice of a particular process. I am questioning, however, the decision to ignore other significant toxins in the groundwater, and particularly the long-lived radioactive contaminants of concern. Unlike TCE, uranium and thorium and radium -- also known carcinogens -- will not break down, volatilize, microbially degrade or otherwise "naturally attenuate." They will continue giving off radioactive particles and rays for literally hundreds of thousands or even billions of years into the future -- that is, they will remain hazardous virtually forever. The proposal to leave these poisons in the St. Charles groundwater, upstream from St. Louis, is surprising and, I believe, irresponsible.

I am writing this letter to submit questions and comments about the proposed plan, but also to request additional time for the public to respond, preferably at a public hearing in St. Louis, the major nearby community downstream that is dependent upon the Missouri River for drinking water. I was out of town on vacation the first three weeks in August when the packet of documents arrived announcing the August 25 meeting. Most people who are able to take summer vacations do so in June, July or August. Furthermore, I'm told the St. Louis Post-Dispatch did not publish information about the public meeting in advance (or afterwards).

1. The greatest surprise of the "Proposed Plan" is the conclusion that TCE has been designated "the predominant potential risk driver" at Weldon Spring and that its chemical oxidation "offers the greatest potential for short-term

reduction" of risk. (p. 43) How and when was the decision made that "TCE treatment" was to be the critical goal of the groundwater cleanup (e.g., Table 4)? The contamination by TCE and other volatile organic compounds was not even detected until 1996. ("Weldon Spring Site Environmental Report, 1998," pp. 138-9) That was long after many scientists and engineers had acknowledged the existence of groundwater contamination, and the unquestionable need to resolve it. With the DOE's preferred Alternative 9, "some treatment of nitroaromatic compounds in addition to TCE might also occur." (emphases added; page 39) But what about such Weldon Spring contaminants as arsenic, manganese, cadmium, selenium, and radioactive uranium and thorium and . . . ?

2. Available monitoring equipment apparently is not yet capable of detecting thorium in water, and not even always accurately in soil. (Unfortunately, neither the government nor corporations seem to have any interest in developing more precise measuring instruments.) While it is known that not just uranium and thorium were discharged out the stacks at the Weldon Spring chemical plant -- and therefore the related daughter products, such as, radium, polonium, radon and lead-210 -- measurement of the range and depth of the resulting contamination of the soil did not extend throughout the 200-acre tract. How much of the soil contaminants will continue leaching into the groundwater?

3. At Fernald, Ohio, where the same type of uranium processing facility operated, vertical extraction wells have been installed as a part of the Aquifer Restoration Project in order to pump contaminated groundwater for treatment before releasing it to the Great Miami River. Why is the DOE's Fernald project receiving funds for thorough groundwater remediation, and not Weldon Spring? -- The Fernald modeling data estimated that the uranium levels in the aquifer would reach the proposed drinking water standard within 27 years at the expected pumping rate. Having already spent $900 million and several decades on the Weldon Spring cleanup, would additional funding and an extended duration not be warranted? Why are citizens in St. Charles County not asking that question -- and others?

4. Two or three of the highest uranium levels in groundwater in 1998 were collected along the KATY trail (next to the south wall of the quarry -- namely, monitoring wells 1006, 1008 and 1032 -- according to the "Weldon Spring Environmental Report, 1998," pp. 148, 151). The predominant uranium isotope (U-238) has a half-life of 4.5 billion years; thorium-232, also present at Weldon Spring, has a half-life of 14.1 billion years. Adherence to Superfund requirements dictates that a review must be conducted every five years at locations where the groundwater contaminant levels exceed permissible standards for unlimited use by the public. Every five years -- for how many millennia?

5. Because of the "complex hydrogeology and heterogeneous geology of the site," including greater transmissivity than expected, "a pump and treat technology is not technically practicable" for cleaning up the groundwater, nor is sophisticated groundwater modeling possible. (p. 44) This complex geology -- predominantly karst! -- and the "innovative nature of the technology" make even the chosen TCE treatment highly uncertain. Waivers of the TCE standard may be required and of the nitrate and nitroaromatic requirements, as well. Are these concerns not reminiscent of some of the many reasons the State of Missouri had formerly forbidden the siting of hazardous

waste facilities within a karst terrain?

6. "The proposed Maximum Concentration Level of 20 micrograms per liter for uranium is regarded as a to-be-considered requirement (TBC) for this action." (p.44) What does that mean? What standard, if any, would rule?

7. According to the Code of Federal Regulations," Title 40, Sections 265.90-94, a groundwater monitoring program must be continued throughout the life of a hazardous waste disposal facility licensed under the Resource Conservation and Recovery Act of 1976, as amended (RCRA). The design life of a facility outlines how long it will function adequately. Maybe a hazardous waste disposal cell won't leak for ten years, but as you get closer to the design life, greater leakage should be anticipated. If DOE is not committed to removing the predominant contaminants of concern from the groundwater even before the disposal cell is completed, is it not probable the groundwater will never meet RCRA standards?

8. How can either the Southeast Drainage Ditch (originally, an outfall sewer for the uranium plant process wastes) or the Burgermeister Spring be called an "end point"? (p. 8)

Some comments:

1. Although domestic wells are not currently located within the site, drinking water is obtained both from the Missouri and Mississippi rivers into which the groundwater flows. Also, the groundwater and springs impact upon lakes used for fishing, and perhaps upon such streams as the Dardenne. Unfortunately, a great deal is unknown about the directions and flow rates of groundwater, and particularly at a site underlain by a karst aquifer. And within time frames of thousands of years and beyond.

2. An estimated 3500 curies of thorium alone will be piled into the disposal cell at Weldon Spring. I urge anyone making decisions about the future of the cell -- with its 2.5 million tons/five billion pounds of radioactive and hazardous wastes -- to reflect on the magnitude of the danger. Perhaps the best comparison is with the amount of radioactivity used by the physicians, scientists and technicians who work with radioisotopes at the Washington University Medical Center: 1,069 laboratories use a total of TWO curies at any one time.

3. As a St. Louis resident who gets her drinking water from the Missouri River only nine miles downstream from the major Weldon Spring groundwater and surface water discharge pathways, and as a taxpayer who helped pay for the billion-dollar Weldon Spring remediation project, I find three of the DOE's reasons for not being able to clean up the groundwater both interesting and disheartening:

<> The hydrogeology present in the shallow groundwater system is highly complex and unfavorable (i.e., karst features such as paleochannels, conduits, fractures, weathering, and dissolution features) for remediation using extraction methods;

<> In spite of source removal at the ground surface, residual contaminants are likely to be present in undefinable and irremovable

quantities in the karst features beneath the chemical plant area; and

<> Cleanup times estimated by using very optimistic extraction rates are still excessively long (i.e., hundreds to thousands of years depending on the contaminant of concern). (p. 45)

I believe the Environmental Protection Agency should question the DOE's claim that it will be remediating the Weldon Spring groundwater and springs when it will only be focusing on one volatile solvent in one limited area of the site and will be ignoring the predominant, long-lived contaminants of concern -- that is, uranium, thorium and their radioactive daughter products. If the groundwater and springs are not cleaned up, the public should be appropriately warned.

Weldon Spring is certainly safer than it was twenty or thirty years ago, and the DOE deserves credit. But I question whether Weldon Spring is safe enough yet to become a park -- or even a neighbor.

Sincerely,

Kay Drey

Kay Drey

March 21, 2000

Concerns Arise Over Aquifer Near Nuclear Test Site

3/21/00

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Forum

- Join a Discussion on The Environment

By MARTIN FORSTENZER

When the federal government conducted 828 underground nuclear tests at the Nevada Test Site from 1956 to 1992, its scientists knew that ground water beneath the site would become contaminated. They believed that the underground water barely moved, and that radioactive particles would be sealed into cavities by the blasts or else absorbed by underground rock.

But studies in recent years have found that radioactive particles like long-lived plutonium 239 can travel with water, and that water is flowing more rapidly beneath the site than was once believed. Scientists now agree that contaminated plumes have the potential to flow beyond the borders of the 1,573 square-mile test site in south-central Nevada, toward populated areas.

The trouble is that no one knows how big the plumes are, where they have already traveled or what exactly they contain. Scientists from the United States Geological Survey and the University of Nevada say that a witch's brew of radionuclides could take as little as a decade to reach well water in Beatty, a town of 1,500 people in the Oasis Valley about 25 miles from the heavily contaminated northwest corner of the test site.

"Could it show up there in the next 10 years?" Randell Laczniak, a Geological Survey hydrologist and a co-author of a 1996 report on ground water at the test site, said in an interview.

"There's that possibility. Will it show up at a dangerous level? I don't know."

Spokesmen for the Department of Energy, which administers the test site, were more conservative.

Bob Bangerter, manager of the Energy Department's program handling the ground water issue, said that because some underground tests occurred near the test site's western boundary at the heavily contaminated Pahute Mesa area and the water was moving toward the southwest, "there is a high potential that it will move off of the test site toward the Oasis Valley." But he would not estimate when this might happen.

in ground water over distances of several miles in concentrations that would be harmful. But the finding increased concern among scientists about the potential health threat from the ground water.

The one radionuclide at the site that is known to travel freely with water is tritium, a hydrogen isotope that becomes part of water molecules.

Although it decays in only 12.3 years, tritium can remain dangerous to humans for hundreds of years when found in the kinds of large concentrations that the test site holds, Dr. Weber said. Other elements that contaminate the site include neptunium and americium, but little is known about their ability to travel in ground water.

Because Death Valley National Park is the end point of ground water flow for the region, scientists said that water from the test site would probably reach there eventually and could threaten the park, although most believe that it would take longer than a hundred years.

For residents near the test site, the focus on contaminated ground water has compounded fears about the Yucca Mountain nuclear waste repository, which the federal government plans to build near the western border of the Nevada Test Site not far from Beatty and other populated areas.

By making the idea of contaminated ground water less abstract, it has sharpened public worries about what might happen if radioactive material leaked from the site, which would hold tons of high-level radioactive waste from around the country.

There is no feasible way to clean the ground water of contaminants or divert it from flowing toward a particular place. But to prepare for the possibility that contaminants might someday reach a populated area, the Energy Department has studied a variety of costly, experimental plans, including trying to mine out contaminants at the test site, which would cost trillions of dollars and present serious health risks to workers, diverting the ground water back onto the test site, and piping or trucking water to affected communities.

In Beatty, the issue has been a leading topic of discussion. "I'm concerned for a lot of reasons," said LaRene Younghans, who owns a ranch just north of Beatty. "We wanted to stay here until we died, and we'll probably have to move."

Such worries spiked in late February when Nye County officials reported that a very high level of radiation was found in one monitoring well south of the Oasis Valley. The report prompted calls to the Energy Department from county residents and spurred emergency meetings of town and county officials, but it turned out to be a false alarm: the initial well analysis was faulty.

Some scientists who have studied the issue believe that the Energy Department has never really tried to learn much about the contaminated ground water in order to keep public pressure off the agency.

"They haven't drilled wells with the intention of finding the plumes," Dr. Weber said. "They didn't want to know."

A spokeswoman for the department, Nancy Harkess, responded: "We are looking and we do want to find it if it's moving. Our No. 1 priority is to protect the public."

Nuclear Sites May Be Toxic In Perpetuity, Report Finds

NYT - 8/8/00

WASHINGTON, Aug. 7 — Most of the sites where the federal government built nuclear bombs will never be cleaned up enough to allow public access to the land, and the plan for guarding sites that are permanently contaminated is inadequate, the National Academy of Sciences said today in a report.

"At many sites, radiological and nonradiological hazardous wastes will remain, posing risks to humans and the environment for tens or even hundreds of thousands of years," the report said. "Complete elimination of unacceptable risks to humans and the environment will not be achieved, now or in the foreseeable future."

The idea that the production of nuclear weapons has produced "national sacrifice zones," land that the public can never use again, is not new. The term became common in environmental circles in the late 1980's, when the United States began recognizing the environmental legacy of the Manhattan Project, the effort during World War II to develop atomic weapons, and the cold war.

But the report, commissioned by the Department of Energy, goes a step further. It says that the government can try to declare certain areas permanently off-limits, but that it lacks the technology, money and management techniques to prevent the contamination from spreading.

In addition, some of the contaminants have already "migrated" outside plant boundaries and others will follow, the report said.

Thomas M. Leschine, the chairman of the committee that wrote the report, said managers could use barbed wire and guards at the sites.

But Dr. Leschine, an associate professor in the School of Marine Affairs at the University of Washington, added: "There's no assurance that we can maintain any of that control. It's one thing to put a fence up around something, but it's really something else to maintain it in perpetuity."

Controls on the use of some of the land are already breaking down, the report said. For example, in the early 1990's, the Department of Energy sold land near its Oak Ridge Reservation in Tennessee for use as a golf course, stipulating that the groundwater was contaminated and was not to be used. "Within a few years, however, D.O.E. discovered that a well was being drilled to irrigate the golf course," the report said.

Dr. Leschine said the committee had found another case in which the Department of Energy had posted "no fishing" signs at a creek near Oak Ridge because of radiation contamination in the water.

"The signs all got stolen, because the local high school kids thought they were nice things to have," he said. "Then there were months of protracted battles between the local authorities and the Department of Energy, over whose responsibility it was to replace the signs."

At the Department of Energy, Gerald G. Boyd, the deputy assistant secretary for science and technology, said his agency established a long-term stewardship office a year ago to cope with the problem, with about a dozen people working with engineers and planners at the various sites. [illegible] soon after the department requested the study from the National Academy of Sciences, Mr. Boyd said.

The department has accelerated its clean-up efforts, reduce the costs involved and minimize risks to surrounding communities, but a perfect cleanup is not possible, he said.

As an example of the breakdown of control, Dr. Leschine cited the fire that endangered the Los Alamos National Laboratory, in New Mexico, in May. The fire set the stage for mudslides in the coming rainy season that could contaminate the Rio Grande with radioactive and chemical toxins from the laboratory.

But the cause of the blaze was not natural or malicious; the fire was set by another government agency as part of its land-management efforts.

The report said that no plan written now to minimize the spread of uncontained wastes would suffice over the tens, hundreds or even thousands of years that some of the contaminants would remain dangerous.

It urged the department to assume that engineered barriers like concrete and steel would eventually fail, and that most of what was known about the behavior of contaminants in air, soil or water might "eventually be proven wrong." The department needs a long-term program that "actively seeks out and applies new knowledge," the report said.

The report identified 144 sites where the department and its predecessors, notably the Atomic Energy Commission, processed nuclear materials, and it said that 101 would not be cleaned up enough for unrestricted release, because of insufficient money, technical skill or political will to do the job.

CULVER
202 Wolfram Rd.
Weldon Spring, MO 63304

Steve McCracken
Project Manager WSRAP
7295 Highway 94 South
Weldon Spring MO. 63304 Via Fax: 636-447-0739
August 14, 2000

Dear Mr. McCracken:

I am writing to express my extreme concern over the future plans for the containment of the radioactive waste found in our community.

I am a 30 year resident of Weldon Spring, and was in attendance for the first meeting when the government began the process of correcting their wrong. I welcomed the action yet was very and remain to this day weary of the success and security of containment.

I am writing to reaffirm this concern for today. To finally see the enormity of the mound that has been created brings home the scope of the problem. I remain skeptical that the ground in the pit will seal and prevent the future contamination of groundwater. I have a shallow well that supplies my family with water for living. We have been monitored by the state since the inception of the project and have learned how easily water can be contaminated by agricultural chemicals. The levels of nitrates in our water already make it necessary for us to filter the water.

Given the nature of radioactive material, the concentration you have created, and the nature of our karst topography, I remain concerned and uncomfortable for the future impact of your site on the greater the St. Louis area, the Weldon Spring Community and my family's source of water and health.

I urge you to continue to insure the site remains contained, and the project goal of returning the area to a state consistent with its natural background be continued. Groundwater can not be permitted to be contaminated by run off or leaching or neglect. Citizens of the area can not be permitted to use or even consider this lethal site to be a park. The continued monitoring of the impact you and your successors' site has on this area, as well as the constant reevaluation of the methods and materials used for containment must last as long as the poisons that have been buried.

Thank you for your consideration and you vigilance.

Most sincerely,

Stephen Culver

Stephen Culver

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AUG 15 2000

August 14, 2000

Mr. Stephen McCracken, Project Manager
Weldon Spring Site - Department of Energy
7295 Highway 94 South
St. Charles, Mo. 63304
Fax 1-636-447-0739

Re: Clean up of Weldon Spring Radioactive Groundwater

Dear Mr.McCracken:

I am writing as a concerned citizen, requesting that clean-up efforts at Weldon Spring include clean-up of the groundwater to safe drinking water standards.

It is my understanding that DOE is proposing to only treat the groundwater for trichloroethylene (TCE) with no guarantee that this will be continued until acceptable standards are reached. Also, DOE proposed NO treatment for the radioactive contamination (uranium) or the explosives waste in the aquifer. I understand that technologies are available that can remove much of the radioactive and hazardous waste from the groundwater. I consider it essential that these current technologies be applied to eliminate the hazards at this site.

Sincerely,

Kim Kitson

Kim Kitson
4927 Quincy St.
St. Louis, Mo. 63109

556 Oakhaven Lane
Creve Coeur, MO. 63141
August 13, 2000

Stephen McCracken
Project Manager
Weldon Spring Site Remedial Action Project Office
7295 Hwy 94 South
St. Charles, MO 63304

Dear Mr. McCracken:

I urge you not to terminate clean-up operations at Weldon Springs until the ground water there has been decontaminated of radioactive isotopes and other industrial chemicals such as trichloroethylene to levels acceptable for drinking water.

Because of the dangers associated with migration of contaminants into the drinking water sources for this metro area, the contaminants must be eliminated.

Citizens of this metro area were not the ones who decided to locate the nuclear operation in our midst. Therefore, we should not be the ones to suffer from, or pay the price of, the resulting contamination, other than as federal taxpayers. The federal government is responsible for the original decisions and should accept responsibility for total clean-up.

Thank you for your consideration.

Sincerely, Virginia Harris

August 15, 2000

Mr. Steven McCracken
Project Manager
Weldon Springs Site -DOE
7295 Hway 94 South
St. Charles, MO 63304

Dear Mr. McCracken

I am a twenty-one year retired employee of Mallinckrodt Chemical (St. Louis plant) and have lived in St. Charles County for the past twenty years. My husband and I have had the pleasure of raising our three sons in this community. I remember when my boys were young, they would dress in their camouflage cloths, pack a lunch and battle gear, and spend the day reconnoitering the creeks behind our house. Harmless fun!? A half-mile down stream from our house is the Dardenne Creek. Upon learning of the contamination of the Dardenne Creek from the old Weldon Springs Plant, I passed orders making the creeks off limits and any soldiers caught in this unauthorized area would be court-martialed. In looking back, I know now that I was more fortunate than other mothers in our community because I had an awareness of the hazards from the run off of the old weapons plant at Weldon Springs. Of course then as now, the DOE was telling people in this community that the Dardenne Creek was safe.

We are all thankful that the DOE did the clean up of the old weapons plant. I know that they did the best job possible and that the project will present many challenges in the future. My hope is that the DOE will continue to work with the Missouri Department of Natural Resources to experiment on new technologies to clean up our ground water so that someday, even people like me can say that the Dardenne Creek is safe!

Sincerely,

Kathy Collins

Kathy Collins
26 South Joyce Ellen Way
St. Peters, MO 63376
636-397-1227

6947 Columbia Ave.
St. Louis, MO 63130
Aug.11, 2000

Steve McCracken, Project Manager
Weldon Spring Site-DOE
7295 Highway 94 South
St. Charles, MO 63304

Comments on the Groundwater Proposal for Weldon Spring

I have been a resident of the St. Louis area since 1967 and for many of those years, I have been aware that the metropolitan area has been a dumping ground for nuclear wastes generated here since the forties. In August of 1982, I was one of some 2300 area residents attending a public hearing at Frances Howell High School about the wastes at Weldon Spring. At that hearing, the overwhelming public sentiment was for cleaning up the site completely. We knew then that the well field from which many St. Charles County residents got their drinking water was at risk because of the migration of contaminants from the Weldon Spring site. Those of us whose drinking water source is the Missouri River were aware that contaminants from the site might also reach our drinking water intake. After eighteen years, I am simply amazed that the DOE is proposing not to treat the groundwater at the uranium plant site except for TCE.

Recently, there has been a lot of media attention given to the growing scarcity of clean drinking water and the increasing threats to the oceans and to groundwater because of pollutants. Cover stories in the July, 2000 Harper's as well as in the January/February 2000 issue of World Watch (which I enclose) give alarming evidence of such threats. The article in World Watch specifically mentions the Weldon Spring site here in Missouri, with a focus on its nitroaromatic wastes. Given this serious global problem and the virtual impossibility of purifying an aquifer, how can the DOE recommend the irresponsible action of leaving most of the wastes untreated in the groundwater?

The DOE is counting on the mechanisms of attenuation - dilution and dispersion - to reduce the hazards of radioactive contamination. The DOE admits:"The primary uranium isotopes found at the site - uranium-234,-235, and -238 (>99%) - have half-lives of 245,000, 8 million, and 4.5 billion years, respectively. Thus, radioactive decay is not a

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AUG 15 2000

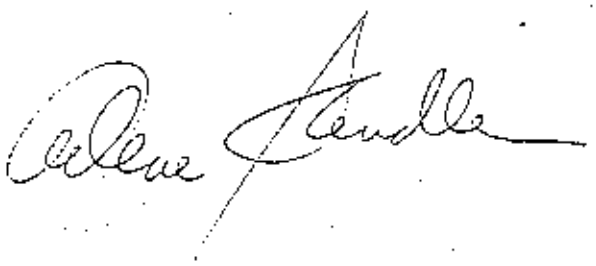
significant attenuation pathway for uranium at the GWOU." (p. 23, "Supplemental Feasibility Study for Remedial Action for the Groundwater Operable Unit at the Chemical Plant Area of the Weldon Spring Site. June, 1999) These contaminants will remain hazardous far beyond the "forseeable future."

The DOE recommends leaving the groundwater untreated because of the difficulty of pumping from the shallow acquifer. But in a letter to Dennis Grams, Regional Administrator of the EPA's Region VII, recently retired state geologist James H. Williams stated that the pumping is feasible and he recommends that careful analysis of the groundwater contaminants as well as pumping tests be performed.

In the DOE's proposal for remedial action, the population of St. Charles County is given as 100,000. According to a demographer with the East-West Gateway Coordinating Council, whom I called recently, the estimated population of St. Charles County as of January, 2000 is 284,700. In the last ten years, the growth rate has been about 3.4% annually. Many more people, then, than in the DOE's estimate would be at risk from the contaminants from the Weldon Spring site.

The proposal only mentions "radiation-induced cancer" as a health effect. It has been scientifically established, however, that low-level radiation can cause genetic mutations, birth defects, and reproductive, immune, endocrine, and circulatory disorders. Any exposure to radiation increases a person's risk.

I hope that the DOE will select a more sensible alternative. The "chemical soup" at the site has never been fully characterized, the geology there is mainly karst, the population of the metropolitan area is large and all possible cleanup technologies have not been fully tested or seriously considered. These are compelling reasons against the current proposal, a proposal which could eventually result in an irreversible contamination of the underlying aquifer.



Groundwater *Shock*

The Polluting of the World's Major Freshwater Stores

Scientists have shown that the world deep beneath our feet is essential to the life above. Ancient myths depicted the Underworld as a place of damnation and death. Now, the spreading contamination of major aquifers threatens to turn the myth into a tragic reality.

by Payal Sampat

The Mississippi River occupies a mythic place in the American imagination, in part because it is so huge. At any given moment, on average, about 2,100 billion liters of water are flowing across the Big Muddy's broad bottom. If you were to dive about 35 feet down and lie on that bottom, you might feel a sense of awe that the whole river was on top of you. But in one very important sense, you'd be completely wrong. At any point in time, only 1 percent of the water in the Mississippi River system is in the part of the river that flows downstream to the Gulf of Mexico. The other 99 percent lies beneath the bottom, locked in massive strata of rock and sand.

This is a distinction of enormous consequence. The availability of clean water has come to be recognized as perhaps the most critical of all human security issues facing the world in the next quarter-century—and what is happening to water buried under the bottoms of rivers, or under our feet, is vastly different from what happens to the "surface" water of rivers, lakes, and streams. New research finds that contrary to popular belief, it is groundwater that is most dangerously threatened. Moreover, the Mississippi is not unique in its ratio of surface to underground water; worldwide, 97 percent of the planet's liquid freshwater is stored in aquifers.

In the early centuries of civilization, surface water was the only source we needed to know about. Human population was less than a tenth of one percent the size it is now; settlements were on river banks; and the water was relatively clean. We still think of surface water as being the main resource. So it's easy to think that the problem of contamination is mainly one of surface water: it is polluted rivers and streams that threaten health in times of flood, and that have made waterborne diseases a major killer of humankind. But in the past century, as population has almost quadrupled and rivers have become more depleted and polluted, our dependence on pumping groundwater has soared—and as it has, we've made a terrible discovery. Contrary to the popular impression that at least the waters from our springs and wells are pure, we're uncovering a pattern of pervasive pollution there too. And in these sources, unlike rivers, the pollution is generally irreversible.

This is largely the work of another hidden factor: the rate of groundwater renewal is very slow in comparison with that of surface water. It's true that some aquifers recharge fairly quickly, but the average recycling time for groundwater is 1,400 years, as opposed to only 20 days for river water. So when we pump out groundwater, we're effectively removing it from aquifers for generations to come. It may evaporate and return to the atmosphere quickly enough, but the resulting rainfall (most of which falls back into the oceans) may take centuries to recharge the aquifers once they've been depleted. And because water in aquifers moves through the Earth with glacial slowness, its pollutants continue to accumulate. Unlike rivers, which dash themselves into the

ILLUSTRATIONS BY PATRICK GNAN

oceans, aquifers become sinks for pollutants, decade after decade—thus further diminishing the amount of clean water they can yield for human use.

Perhaps the largest misconception being exploded by the spreading water crisis is the assumption that the ground we stand on—and what lies beneath it—is solid, unchanging, and inert. Just as the advent of climate change has awakened us to the fact that the air over our heads is an arena of enormous forces in the midst of titanic shifts, the water crisis has revealed that, slow-moving though it may be, groundwater is part of a system of powerful hydrological interactions—between earth, surface water, sky, and sea—that we ignore at our peril. A few years ago, reflecting on how human activity is beginning to affect climate, Columbia University scientist Wallace Broecker warned, "The climate system is an angry beast and we are poking it with sticks." A similar statement might now be made about the system under our feet. If we continue to drill holes into it—expecting it to swallow our waste and yield freshwater in return—we may be toying with an outcome no one could wish.

Valuing Groundwater

For most of human history, groundwater was tapped mainly in arid regions where surface water was in short supply. From Egypt to Iran, ancient Middle Eastern civilizations used periscope-like conduits to funnel spring water from mountain slopes to nearby towns—a technology that allowed settlement to spread out from the major rivers. Over the centuries, as populations and cropland expanded, innovative well-digging techniques evolved in China, India, and Europe. Water became such a valuable resource that some cultures developed elaborate mythologies imbuing underground water and its seekers with special powers. In medieval Europe, people called water witches or dowsers were believed to be able to detect groundwater using a forked stick and mystical insight.

In the second half of the 20th century, the soaring demand for water turned the dowsers' modern-day counterparts into a major industry. Today, major aquifers are tapped on every continent, and groundwater is the primary source of drinking water for more than 1.5 billion people worldwide (see table, page 12). The aquifer that lies beneath the Huang-Huai-Hai plain in eastern China alone supplies drinking water to nearly 160 million people. Asia as a whole relies on its groundwater for nearly one-third of its drinking water supply. Some of the largest cities in the developing world—Jakarta, Dhaka, Lima, and Mexico City, among them—depend on aquifers for almost all their water. And in rural areas, where centralized water supply systems are undeveloped, groundwater is typically the sole source of water. More than 95 percent of the rural U.S. population depends on groundwater for drinking.

A principal reason for the explosive rise in groundwater use since 1950 has been a dramatic expansion in irrigated agriculture. In India, the leading country in total irrigated area and the world's third largest grain producer, the number of shallow tubewells used to draw groundwater surged from 3,000 in 1960 to 6 million in 1990. While India doubled the amount of its land irrigated by surface water between 1950 and 1985, it increased the area watered by aquifers 113-fold. Today, aquifers supply water to more than half of India's irrigated land. The United States, with the third highest irrigated area in the world, uses groundwater for 43 percent of its irrigated farmland. Worldwide, irrigation is by far the biggest drain on freshwater: it accounts for about 70 percent of the water we draw from rivers and wells each year.

Other industries have been expanding their water use even faster than agriculture—and generating much higher profits in the process. On average, a ton of water used in industry generates roughly $14,000 worth of output—about 70 times as much profit as the same amount of water used to grow grain. Thus, as the world has industrialized, substantial amounts of water have been shifted from farms to more lucrative factories. Industry's share of total consumption has reached 19 percent and is likely to continue rising rapidly. The amount of water available for drinking is thus constrained not only by a limited resource base, but by competition with other, more powerful users.

And as rivers and lakes are stretched to their limits—many of them dammed, dried up, or polluted—we're growing more and more dependent on groundwater for all these uses. In Taiwan, for example, the share of water supplied by groundwater almost doubled from 21 percent in 1983 to over 40 percent in 1991. And Bangladesh, which was once almost entirely river- and stream-dependent, dug over a million wells in the 1970s to substitute for its badly polluted surface-water supply. Today, almost 90 percent of its people use only groundwater for drinking.

Even as our dependence on groundwater increas-

es, the availability of the resource is becoming more limited. On almost every continent, many major aquifers are being drained faster than their natural rate of recharge. Groundwater depletion is most severe in parts of India, China, the United States, North Africa, and the Middle East. Under certain geological conditions, groundwater overdraft can cause aquifer sediments to compact, permanently shrinking the aquifer's storage capacity. This loss can be quite considerable, and irreversible. The amount of water storage capacity lost because of aquifer compaction in California's Central Valley, for example, is equal to more than 40 percent of the combined storage capacity of all human-made reservoirs across the state.

As the competition among factories, farms, and households intensifies, it's easy to overlook the extent to which freshwater is also required for essential ecological services. It is not just rainfall, but groundwater welling up from beneath, that replenishes rivers, lakes, and streams. In a study of 54 streams in different parts of the country, the U.S. Geological Survey (USGS) found that groundwater is the source for more than half the flow, on average. The 492 billion gallons (1.86 cubic kilometers) of water aquifers add to U.S. surface water bodies each day is nearly equal to the daily flow of the Mississippi. Groundwater provides the base contribution for the Mississippi, the Niger, the Yangtze, and many more of the world's great rivers—some of which would otherwise not be flowing year-round. Wetlands, important habitat for birds, fish, and other wildlife, are often largely groundwater-fed, created in places where the water table overflows to the surface on a constant basis. And while providing surface bodies with enough water to keep them stable, aquifers also help prevent them from flooding: when it rains heavily, aquifers beneath rivers soak up the excess water, preventing the surface flow from rising too rapidly and overflowing onto neighboring fields and towns. In tropical Asia, where the hot season can last as long as 9 months, and where monsoon rains can be very intense, this dual hydrological service is of critical value.

Numerous studies have tracked the extent to which our increasing demand on water has made it a resource critical to a degree that even gold and oil have never been. It's the most valuable thing on Earth. Yet, ironically, it's the thing most consistently overlooked, and most widely used as a final resting place for our waste. And, of course, as contamination spreads, the supplies of usable water get tighter still.

Tracking the Hidden Crisis

In 1940, during the Second World War, the U.S. Department of the Army acquired 70 square kilometers of land around Weldon Spring and its neighboring towns near St. Louis, Missouri. Where farmhouses and barns had been, the Army established the world's largest TNT-producing facility. In this sprawling warren of plants, toluene (a component of gasoline) was treated with nitric acid to produce more than a million tons of the explosive compound each day when production was at its peak.

Part of the manufacturing process involved purifying the TNT—washing off unwanted "nitroaromatic" compounds left behind by the chemical reaction between the toluene and nitric acid. Over the years, millions of gallons of this red-colored muck were generated. Some of it was treated at wastewater plants, but much of it ran off from the leaky treatment facilities into ditches and ravines, and soaked into the ground. In 1945, when the Army left the site, soldiers burned down the contaminated buildings but left the red-tinged soil and the rest of the site as they were. For decades, the site remained abandoned and unused.

Then, in 1980, the U.S. Environmental Protection Agency (EPA) launched its "Superfund" program, which required the cleaning up of several sites in the country that were contaminated with hazardous waste. Weldon Spring made it to the list of sites that were the highest priority for cleanup. The Army Corps of Engineers was assigned the task, but what the Corps workers found baffled them. They expected the soil and vegetation around the site to be contaminated with the nitroaromatic wastes that had been discarded there. When they tested the groundwater, however, they found that the chemicals were showing up in people's wells, in towns several miles from the site—a possibility that no one had anticipated, because the original pollution had been completely localized. Geologists

Groundwater as a Share of Drinking Water Use, by Region

Region	Share of Drinking Water from Groundwater (percent)	People Served (millions)
Asia-Pacific	32	1,000 to 1,200
Europe	75	200 to 500
Latin America	29	150
United States	51	135
Australia	15	3
Africa	NA	NA
World		1,500 to 2,000

Sources: UNEP, OECD, FAO, U.S. EPA, Australian EPA.

determined that there was an enormous plume of contamination in the water below the TNT factory—a plume that over the previous 35 years had flowed through fissures in the limestone rock to other parts of the aquifer.

The Weldon Spring story may sound like an exceptional case of clumsy planning combined with a particularly vulnerable geological structure. But in fact there is nothing exceptional about it all. Across the United States, as well as in parts of Europe, Asia, and Latin America, human activities are sending massive quantities of chemicals and pollutants into groundwater. This isn't entirely new, of course; the subterranean world has always been a receptacle for whatever we need to dispose of—whether our sewage, our garbage, or our dead. But the enormous volumes of waste we now send underground, and the deadly mixes of chemicals involved, have created problems never before imagined.

What Weldon Spring shows is that we can't always anticipate where the pollution is going to turn up in our water, or how long it will be from the time it was deposited until it reappears. Because groundwater typically moves very slowly—at a speed of less than a foot a day, in some cases—damage done to aquifers may not show up for decades. In many parts of the world, we are only just beginning to discover contamination caused by practices of 30 or 40 years ago. Some of the most egregious cases of aquifer contamination now being unearthed date back to Cold War era nuclear testing and weapons-making, for example. And once it gets into groundwater, the pollution usually persists: the enormous volume, inaccessibility, and slow rate at which groundwater moves make aquifers virtually impossible to purify.

As this covert crisis unfolds, we are barely beginning to understand its dimensions. Few countries track the health of their aquifers—their enormous size and remoteness make them extremely expensive to monitor. As the new century begins, even hydrogeologists and health officials have only a hazy impression of the likely extent of groundwater damage in different parts of the world. Nonetheless, given the data we now have, it is possible to sketch a rough map of the regions affected, and the principal threats they face (see map, page 18, and table, page 21).

The Filter that Failed: Pesticides in Your Water

Pesticides are designed to kill. The first synthetic pesticides were introduced in the 1940s, but it took several decades of increasingly heavy use before it became apparent that these chemicals were injuring non-target organisms—including humans. One reason for the delay was that some groups of pesticides, such as organochlorines, usually have little effect until they bioaccumulate. Their concentration in living tissue increases as they move up the food chain. So eventually, the top predators—birds of prey, for example—may end up carrying a disproportionately high burden of the toxin. But bioaccumulation takes time, and it may take still more time before the effects are discovered. In cases where reproductive systems are affected, the aftermath of this chemical accumulation may not show up for a generation.

Even when the health concerns of some pesticides were recognized in the 1960s, it was easily assumed that the real dangers lay in the dispersal of these chemicals among animals and plants—not deep underground. It was assumed that very little pesticide would leach below the upper layers of soil, and that if it did, it would be degraded before it could get any deeper. Soil, after all, is known to be a natural filter, which purifies water as it trickles through. It was thought that industrial or agricultural chemicals, like such natural contaminants as rock dust, or leaf mold, would be filtered out as the water percolated through the soil.

But over the past 35 years, this seemingly safe assumption has proved mistaken. Cases of extensive pesticide contamination of groundwater have come to light in farming regions of the United States, Western Europe, Latin America, and South Asia. What we now know is that pesticides not only leach into aquifers, but sometimes remain there long after the chemical is no longer used. DDT, for instance, is still found in U.S. waters even though its use was banned 30 years ago. In the San Joaquin Valley of California, the soil fumigant DBCP (dibromochloropropane), which was used intensively in fruit orchards before it was banned in 1977, still lurks in the region's water supplies. Of 4,507 wells sampled by the USGS between 1971 and 1988, nearly a third had DBCP levels that were at least 10 times higher than allowed by the current drinking water standard.

In places where organochlorines are still widely used, the risks continue to mount. After half a century of spraying in the eastern Indian states of West Bengal and Bihar, for example, the Central Pollution Control Board found DDT in groundwater at levels as high as 4,500 micrograms per liter—several thousand times higher than what is considered a safe dose.

The amount of chemical that reaches groundwater depends on the amount used above ground, the geology of the region, and the characteristics of the pesticide itself. In some parts of the midwestern United States, for example, although pesticides are used intensively, the impermeable soils of the region make it difficult for the chemicals to percolate underground. The fissured aquifers of southern Arizona, Florida, Maine, and southern California, on the other hand, are very vulnerable to pollution—and these too are places where pesticides are applied in large quantities.

Pesticides are often found in combination, because

most farms use a range of toxins to destroy different kinds of insects, fungi, and plant diseases. The USGS detected two or more pesticides in groundwater at nearly a quarter of the sites sampled in its National Water Quality Assessment between 1993 and 1995. In the Central Columbia Plateau aquifer, which extends over the states of Washington and Idaho, more than two-thirds of water samples contained multiple pesticides. Scientists aren't entirely sure what happens when these chemicals and their various metabolites come together. We don't even have standards for the many hundred *individual* pesticides in use—the EPA has drinking water standards for just 33 of these compounds—to say nothing of the infinite variety of toxic blends now trickling into the groundwater.

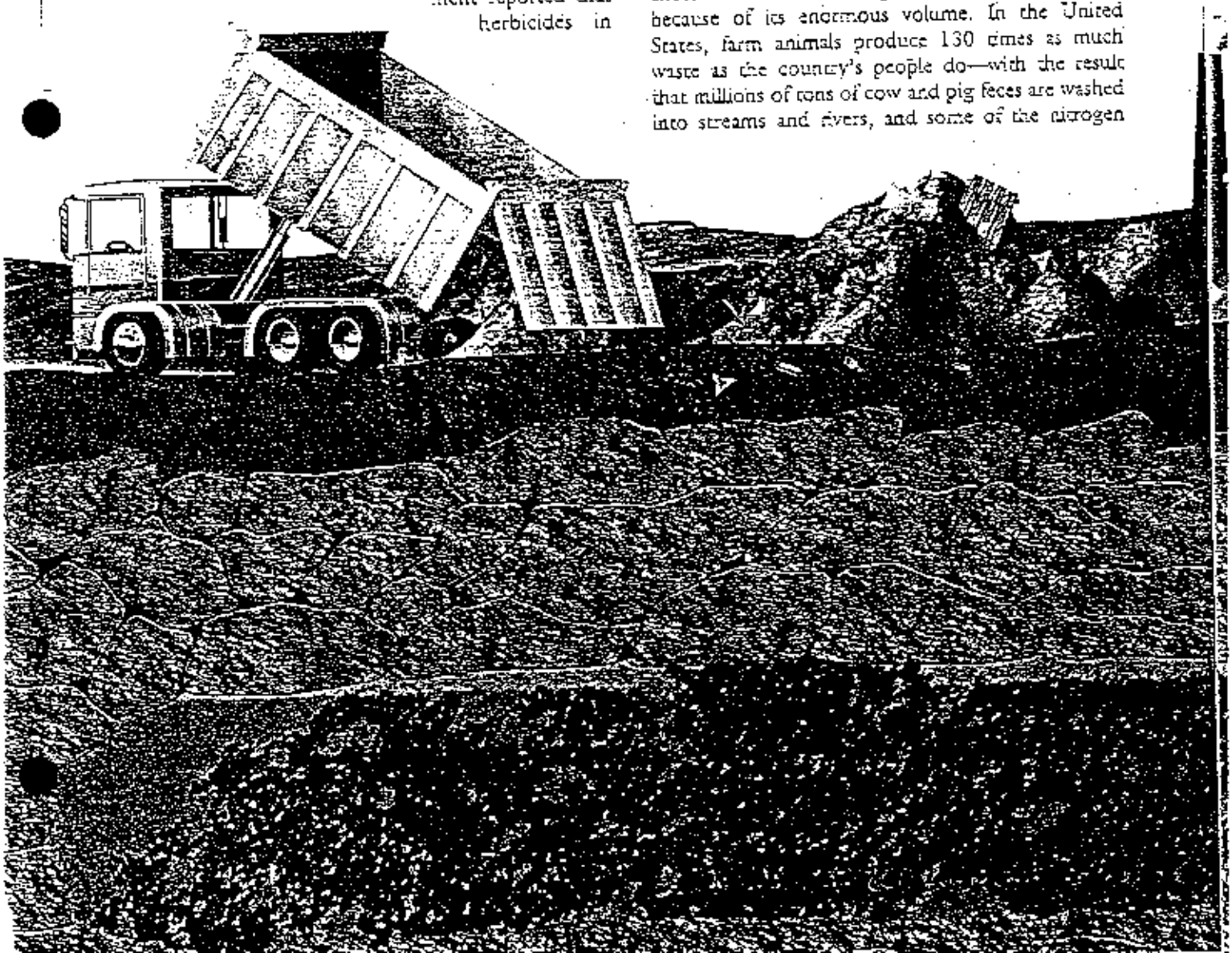
While the most direct impacts may be on the water we drink, there is also concern about what occurs when the pesticide-laden water below farmland is pumped back up for irrigation. One apparent consequence is a reduction in crop yields.

In 1990, the now-defunct U.S. Office of Technology Assessment reported that herbicides in shallow groundwater had the effect of "pruning" crop roots, thereby retarding plant growth.

From Green Revolution to Blue Baby: the Slow Creep of Nitrogen

Since the early 1950s, farmers all over the world have stepped up their use of nitrogen fertilizers. Global fertilizer use has grown ninefold in that time. But the larger doses of nutrients often can't be fully utilized by plants. A study conducted over a 140,000 square kilometer region of Northern China, for example, found that crops used on average only 40 percent of the nitrogen that was applied. An almost identical degree of waste was found in Sri Lanka. Much of the excess fertilizer dissolves in irrigation water, eventually trickling through the soil into underlying aquifers.

Joining the excess chemical fertilizer from farm crops is the organic waste generated by farm animals, and the sewage produced by cities. Livestock waste forms a particularly potent tributary to the stream of excess nutrients flowing into the environment, because of its enormous volume. In the United States, farm animals produce 130 times as much waste as the country's people do—with the result that millions of tons of cow and pig feces are washed into streams and rivers, and some of the nitrogen



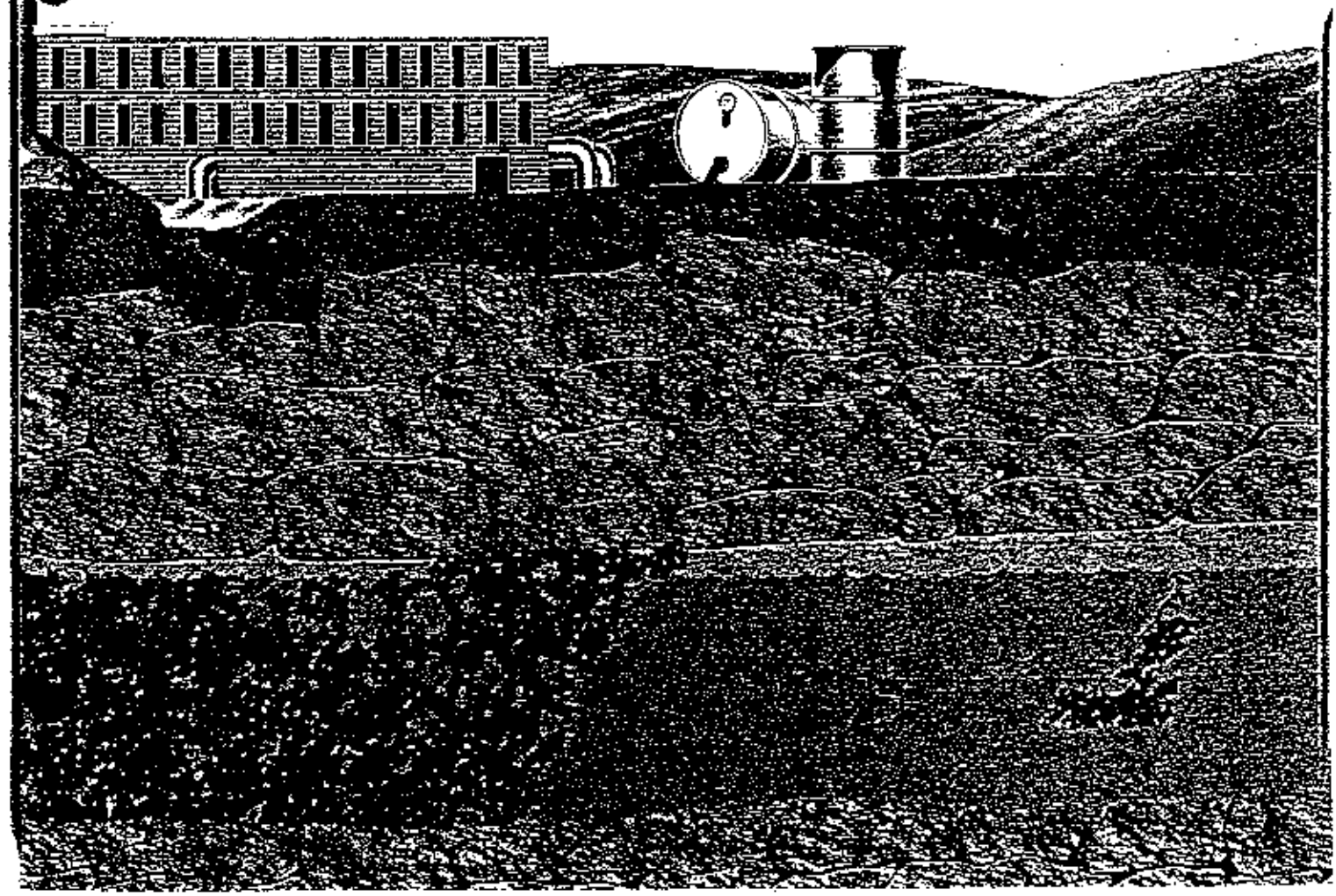
they carry ends up in groundwater. To this Augean burden can be added the innumerable leaks and overflows from urban sewage systems, the fertilizer runoff from suburban lawns, golf courses, and landscaping, and the nitrates leaking (along with other pollutants) from landfills.

There is very little historical information available about trends in the pollution of aquifers. But several studies show that nitrate concentrations have increased as fertilizer applications and population size have grown. In California's San Joaquin-Tulare Valley, for instance, nitrate levels in groundwater increased 2.5 times between the 1950s and 1980s—a period in which fertilizer inputs grew six-fold. Levels in Danish groundwater have nearly tripled since the 1940s. As with pesticides, the aftermath of this multi-sided assault of excess nutrients has only recently begun to become visible, in part because of the slow speed at which nitrate moves underground.

What happens when nitrates get into drinking water? Consumed in high concentrations—at levels above 10 milligrams (mg) per liter, but usually on the order of 100 mg/liter—they can cause infant methemoglobinemia, or so-called blue-baby syndrome. Because of their low gastric acidity, infant digestive systems convert nitrate to nitrite, which blocks the oxygen-carrying capacity of a baby's blood, causing suffocation and death. Since 1945, about 3,000 cases have been reported worldwide—nearly half of them in Hungary, where private wells have particularly high concentrations of nitrates. Ruminant livestock such as goats, sheep, and cows, are vulnerable to methemoglobinemia in much the same way infants are, because their digestive systems also quickly convert nitrate to nitrite. Nitrates are also implicated in digestive tract cancers, although the epidemiological link is still uncertain.

In cropland, nitrate pollution of groundwater can have a paradoxical effect. Too much nitrate can weaken plants' immune systems, making them more vulnerable to pests and disease. So when nitrate-laden groundwater is used to irrigate crops that are also being fertilized, the net effect may be to reduce, rather than to increase production. This kind of over-fertilizing makes wheat more susceptible to wheat rust, for example, and it makes pear trees more vulnerable to fire blight.

In assembling studies of groundwater from around the world, we have found that nitrate pollution is pervasive—but has become particularly severe in the places where human population—and the demand for high food productivity—is most concentrated. In the northern Chinese counties of Beijing, Tianjin, Hebei, and Shandong, nitrate concentrations in groundwater exceeded 50 mg/liter in more than half of the locations studied. (The World Health Organization [WHO] drinking water guideline is 10 mg/liter.) In some places, the concentration had



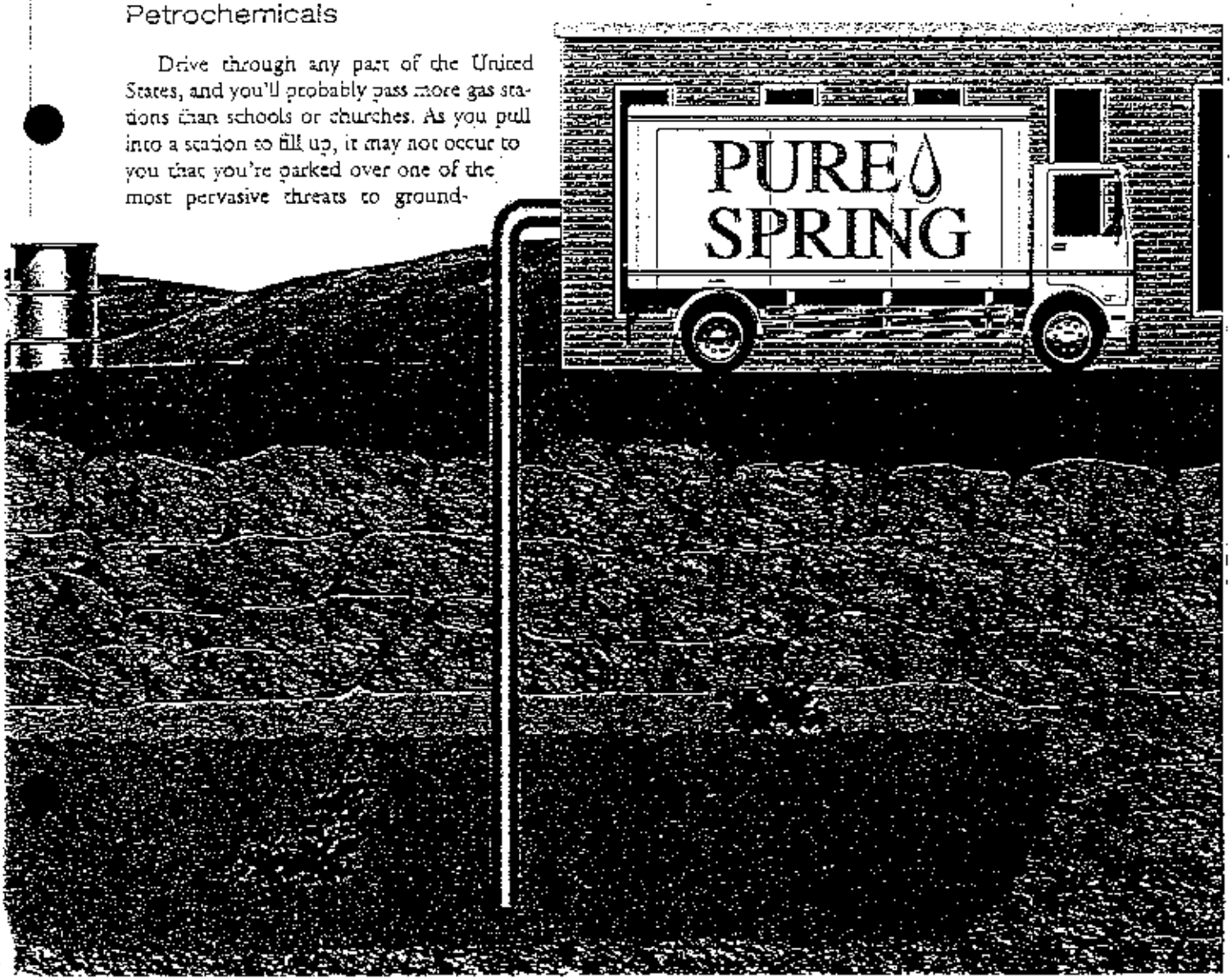
risen as high as 300 mg/liter. Since then, these levels may have increased, as fertilizer applications have escalated since the tests were carried out in 1995 and will likely increase even more as China's population (and demand for food) swells, and as more farmland is lost to urbanization, industrial development, nutrient depletion, and erosion.

Reports from other regions show similar results. The USGS found that about 15 percent of shallow groundwater sampled below agricultural and urban areas in the United States had nitrate concentrations higher than the 10 mg/liter guideline. In Sri Lanka, 79 percent of wells sampled by the British Geological Survey had nitrate levels that exceeded this guideline. Some 56 percent of wells tested in the Yucatán peninsula in Mexico had levels above 45 mg/liter. And the European Topic Centre on Inland Waters found that in Romania and Moldova, more than 35 percent of the sites sampled had nitrate concentrations higher than 50 mg/liter.

From Tank of Gas to Drinking Glass: the Pervasiveness of Petrochemicals

Drive through any part of the United States, and you'll probably pass more gas stations than schools or churches. As you pull into a station to fill up, it may not occur to you that you're parked over one of the most pervasive threats to groundwater: an underground storage tank (UST) for petroleum. Many of these tanks were installed two or three decades ago and, having been left in place long past their expected lifetimes, have rusted through in places—allowing a steady leakage of gasoline into the ground. Because they're underground, they're expensive to dig up and repair, so the leakage in some cases continues for years.

Petroleum and its associated chemicals—benzene, toluene, and gasoline additives such as MTBE—constitute the most common category of groundwater contaminant found in aquifers in the United States. Many of these chemicals are also known or suspected to be cancer-causing. In 1998, the EPA found that over 100,000 commercially owned petroleum USTs were leaking, of which close to 18,000 are known to have contaminated groundwater. In Texas, 223 of 254 counties report leaky USTs, resulting in a silent disaster that, according to the EPA, "has affected, or has the potential to affect, virtually every major and minor aquifer in the state." Household tanks, which store home heating oil, are a problem as well.



Although the household tanks aren't subject to the same regulations and inspections as commercial ones, the EPA says they are "undoubtedly leaking." Outside the United States, the world's ubiquitous petroleum storage tanks are even less monitored, but spot tests suggest that the threat of leakage is omnipresent in the industrialized world. In 1993, petroleum giant Shell reported that a third of its 1,100 gas stations in the United Kingdom were known to have contaminated soil and groundwater. Another example comes from the eastern Kazakh town of Semipalatinsk, where 6,460 tons of kerosene have collected in an aquifer under a military airport, seriously threatening the region's water supplies.

The widespread presence of petrochemicals in groundwater constitutes a kind of global malignancy, the danger of which has grown unobtrusively because there is such a great distance between cause and effect. An underground tank, for example, may take years to rust; it probably won't begin leaking until long after the people who bought it and installed it have left their jobs. Even after it begins to leak, it may take several more years before appreciable concentrations of chemicals appear in the aquifer—and it will likely be years beyond that before any health effects show up in the local population. By then, the trail may be decades old. So it's quite possible that any cancers occurring today as a result of leaking USTs might originate from tanks that were installed half a century ago. At that time, there were gas tanks sufficient to fuel 53 million cars in the world; today there are enough to fuel almost 10 times that number.

From Sediment to Solute: the Emerging Threat of Natural Contaminants

In the early 1990s, several villagers living near India's West Bengal border with Bangladesh began to complain of skin sores that wouldn't go away. A researcher at Calcutta's Jadavpur University, Dipanker Chakraborti, recognized the lesions immediately as early symptoms of chronic arsenic poisoning. In later stages, the disease can lead to gangrene, skin cancer, damage to vital organs, and eventually, death. In the months that followed, Chakraborti began to get letters from doctors and hospitals in Bangladesh, who were seeing streams of patients with similar symptoms. By 1995, it was clear that the country faced a crisis of untold proportions, and that the source of the poisoning was water from tubewells, from which 90 percent of the country gets its drinking water.

Experts estimate that today, arsenic in drinking water could threaten the health of 20 to 60 million Bangladeshis—up to half the country's population—and another 6 to 30 million people in West Bengal. As many as 1 million wells in the region may be contaminated with the heavy metal at levels between 5 and 100 times the WHO drinking water guidelines of 0.01 mg/liter.

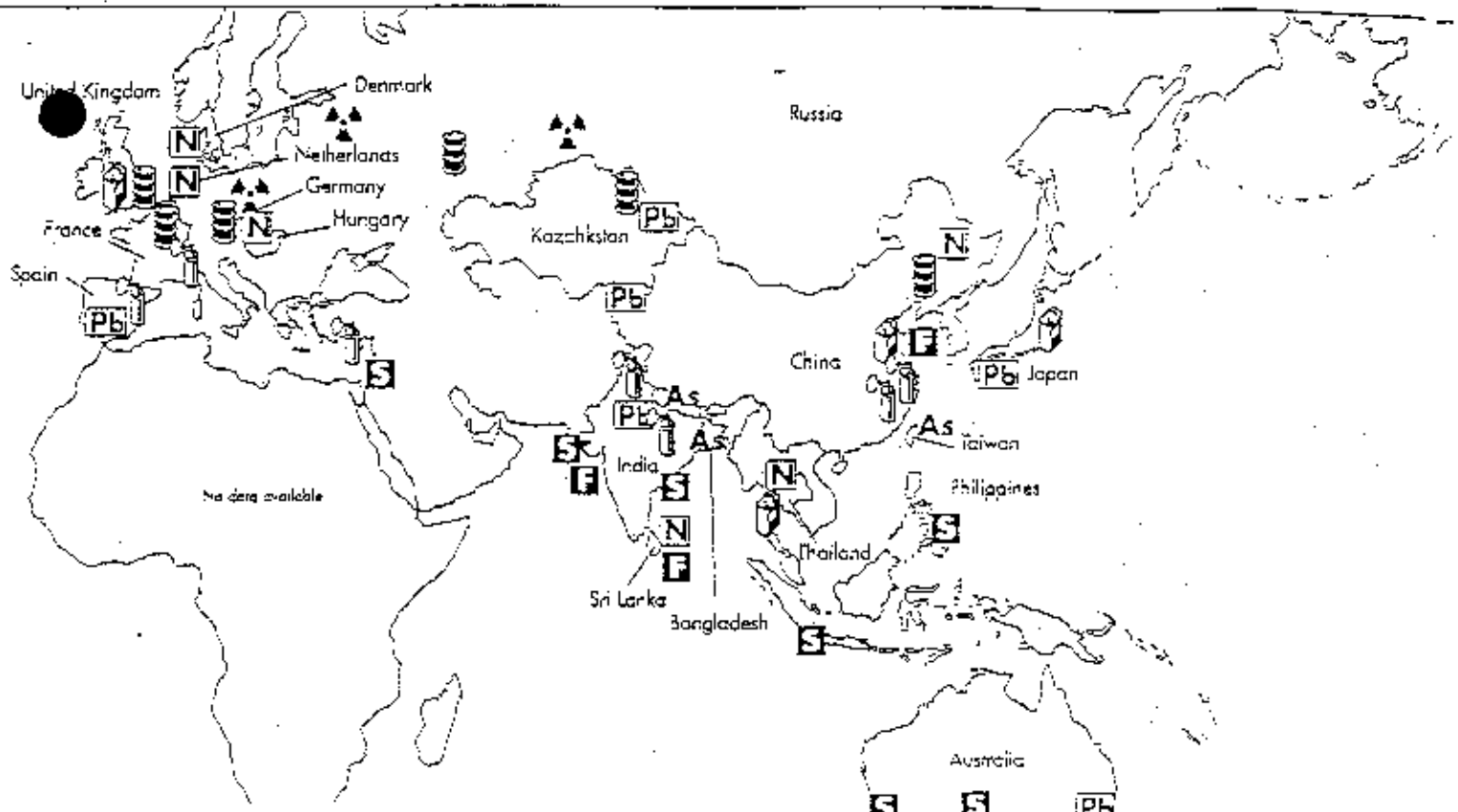
How did the arsenic get into groundwater? Until the early 1970s, rivers and ponds supplied most of Bangladesh's drinking water. Concerned about the risks of water-borne disease, the WHO and international aid agencies launched a well-drilling program to tap groundwater instead. However, the agencies, not aware that soils of the Ganges aquifers are naturally rich in arsenic, didn't test the sediment before drilling tubewells. Because the effects of chronic arsenic poisoning can take up to 15 years to appear, the epidemic was not addressed until it was well under way.

Scientists are still debating what chemical reactions released the arsenic from the mineral matrix in which it is naturally bound up. Some theories implicate human activities. One hypothesis is that as water was pumped out of the wells, atmospheric oxygen entered the aquifer, oxidizing the iron pyrite sediments, and causing the arsenic to dissolve. An October 1999 article in the scientific journal *Nature* by geologists from the Indian Institute of Technology suggests that phosphates from fertilizer runoff and decaying organic matter may have played a role. The nutrient might have spurred the growth of soil microorganisms, which helped to loosen arsenic from sediments.

Salt is another naturally occurring groundwater pollutant that is introduced by human activity. Normally, water in coastal aquifers empties into the sea. But when too much water is pumped out of these aquifers, the process is reversed: seawater moves inland and enters the aquifer. Because of its high salt content, just 2 percent of seawater mixed with freshwater makes the water unusable for drinking or irrigation. And once salinized, a freshwater aquifer can remain contaminated for a very long time. Brackish aquifers often have to be abandoned because treatment can be very expensive.

In Manila, where water levels have fallen 50 to 80 meters because of overdraft, seawater has flowed as far as 5 kilometers into the Guadalupe aquifer that lies below the city. Saltwater has traveled several kilometers inland into aquifers beneath Jakarta and Madras, and in parts of the U.S. state of Florida. Saltwater intrusion is also a serious problem on islands such as the Maldives and Cyprus, which are very dependent on aquifers for water supply.

Fluoride is another natural contaminant that threatens millions in parts of Asia. Aquifers in the drier regions of western India, northern China, and parts of Thailand and Sri Lanka are naturally rich in fluoride deposits. Fluoride is an essential nutrient for bone and dental health, but when consumed in high concentra-



Groundwater Contamination Hotspots

This is a rough regional portrait of aquifer pollution as described in the current scientific literature. The full extent of contamination is not known, since most of the world's aquifers have yet to be tested.

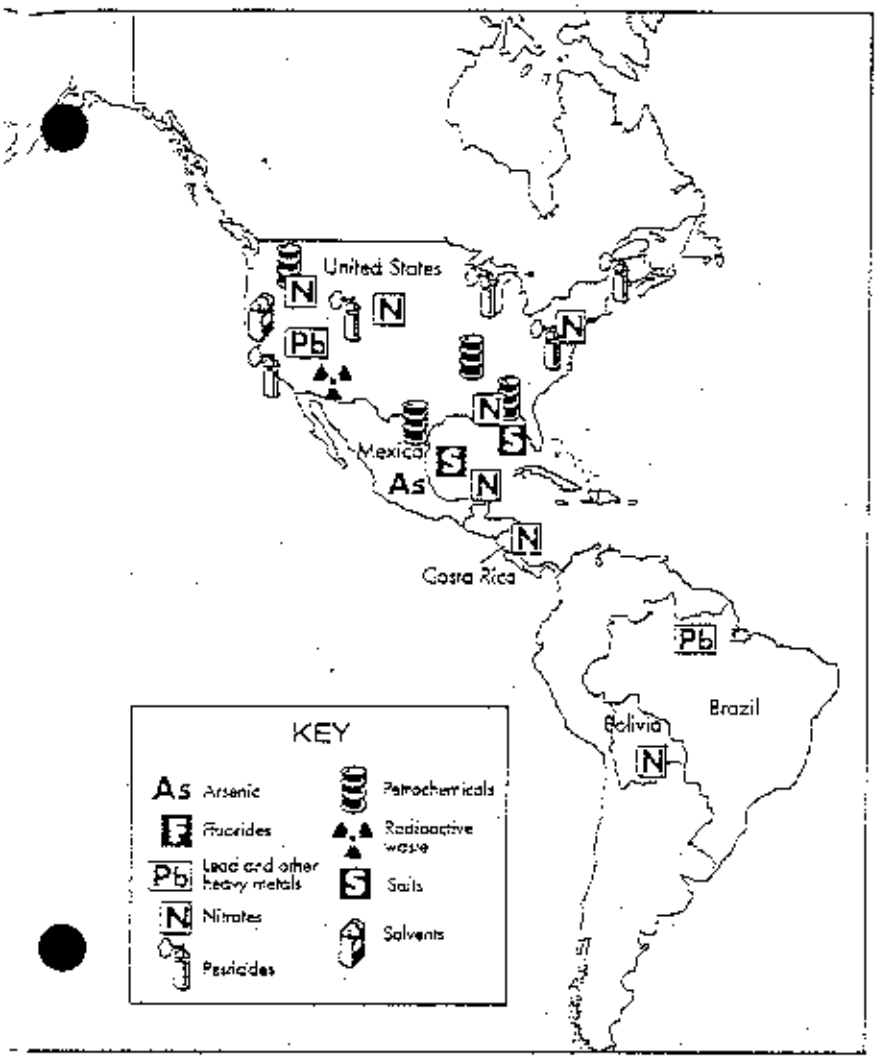
tions, it can lead to crippling damage to the neck and back, and to a range of dental problems. The WHO estimates that 70 million people in northern China, and 30 million in northwestern India are drinking water with high fluoride levels.

A Chemical Soup

With just over a million residents, Ludhiana is the largest city in Punjab, India's breadbasket state. It is also an important industrial town, known for its textile factories, electroplating industries, and metal foundries. Although the city is entirely dependent on groundwater, its wells are now so polluted with industrial and urban wastes that the water is no longer safe to drink. Samples show high levels of cyanide, cadmium, lead, and pesticides. "Ludhiana City's groundwater is just short of poison," laments a senior official at India's Central Ground Water Board.

Like Ludhiana's residents, more than a third of the planet's people live and work in densely settled cities, which occupy just 2 percent of the Earth's land area. With the labor force thus concentrated, factories and other centers of employment also group together around the same urban areas. Aquifers in these areas are beginning to mirror the increasing density and diversity of the human activity above them. Whereas the pollutants emanating from hog farms or copper mines may be quite predictable, the waste streams flowing into the water under cities contain a witch's brew of contaminants.

Ironically, a major factor in such contamination is that in most places people have learned to dispose of waste—to remove it from sight and smell—so effectively that it is easy to forget that the Earth is a closed ecological system in which nothing permanently disappears. The methods normally used to conceal garbage and other waste—landfills, septic tanks, and sewers—become the major conduits of chemical pollution of groundwater. In the United States, businesses drain almost 2 million kilograms of assorted chemicals into septic systems each year, contaminating the drinking water of 1.3 million people. In many parts of the developing world, factories still dump their liquid effluents onto the ground and wait for it to disappear. In the Bolivian city of Santa Cruz, for example, a shallow aquifer that is the city's main water source has had to soak up the brew of sulfates, nitrates, and chlorides



dumped over it. And even protected landfills can be a potent source of aquifer pollution: the EPA found that a quarter of the landfills in the U.S. state of Maine, for example, had contaminated groundwater.

In industrial countries, waste that is too hazardous to landfill is routinely buried in underground tanks. But as these caskets age, like gasoline tanks, they eventually spring leaks. In California's Silicon Valley, where electronics industries store assorted waste solvents in underground tanks, local groundwater authorities found that 85 percent of the tanks they inspected had leaks. Silicon Valley now has more Superfund sites—most of them affecting groundwater—than any other area its size in the country. And 60 percent of the United States' liquid hazardous waste—34 billion liters of solvents, heavy metals, and radioactive materials—is directly injected into the ground. Although the effluents are injected below the deepest source of drinking water, some of these wastes have entered aquifers used for water supplies in parts of Florida, Texas, Ohio, and Oklahoma.

Shenyang, China, and Jaipur, India, are among the scores of cities in the developing world that have had to seek out alternate supplies of water because their groundwater has become unusable. Santa Cruz has also struggled to find clean water. But as it has sunk deeper wells in pursuit of pure supplies, the effluent has traveled deeper into the aquifer to replace the water pumped out of it. In places where alternate supplies aren't easily available, utilities will have to resort to increasingly elaborate filtration set-ups to make the water safe for drinking. In heavily contaminated areas, hundreds of different filters may be necessary. At present, utilities in the U.S. Midwest spend $400 million each year to treat water for just one chemical—atrazine, the most commonly detected pesticide in U.S. groundwater. When chemicals are found in unpredictable mixtures, rather than discretely, providing safe water may become even more expensive.

One Body, Many Wounds

The various incidents of aquifer pollution described may seem isolated. A group of wells in northern China have nitrate problems; another lot in the United Kingdom are laced with benzene. In each place it might seem that the problem is local and can be contained. But put them together, and you begin to see a bigger picture emerging. Perhaps most worrisome is that we've discovered as much damage as we have, despite the very limited monitoring and testing of underground water. And because of the time-lags involved—and given our high levels of chemical use and waste generation in recent decades—what's still to come may bring even more surprises.

Some of the greatest shocks may be felt in places where chemical use and disposal has climbed in the last few decades, and where the most basic measures to shield groundwater have not been taken. In India, for example, the Central Pollution Control Board (CPCB) surveyed 22 major industrial zones and found that groundwater in every one of them was unfit for drinking. When asked about these findings, CPCB chairman D.K. Biswas remarked, "The result is frightening, and it is my belief that we will get more shocks in the future."

Jack Barbash, an environmental chemist at the U.S. Geological Survey, points out that we may not need to wait for expensive tests to alert us to what to expect in our groundwater. "If you want to know what you're likely to find in aquifers near Shanghai or Calcutta, just look at what's used above ground," he says. "If you've been applying DDT to a field for 20

years, for example, that's one of the chemicals you're likely to find in the underlying groundwater." The full consequences of today's chemical-dependent and waste-producing economies may not become apparent for another generation, but Barbash and other scientists are beginning to get a sense of just how serious those consequences are likely to be if present consumption and disposal practices continue.

Changing Course

Farmers in California's San Joaquin Valley began tapping the area's seemingly boundless groundwater store in the late-nineteenth century. By 1912, the aquifer was so depleted that the water table had fallen by as much as 400 feet in some places. But the farmers continued to tap the resource to keep up with demand for their produce. Over time, the dehydration of the aquifer caused its clay soil to shrink, and the ground began to sink—or as geologists put it, to "subside." In some parts of the valley, the ground has subsided as much as 29 feet—cracking foundations, canals, and aqueducts.

When the San Joaquin farmers could no longer pump enough groundwater to meet their irrigation demands, they began to bring in water from the northern part of the state via the California Aqueduct. The imported water seeped into the compacted aquifer, which was not able to hold all of the incoming flow. The water table then rose to an abnormally high level, dissolving salts and minerals in soils that had not been previously submerged. The salty groundwater, welling up from below, began to poison crop roots. In response, the farmers installed drains under irrigated fields—designed to capture the excess water and divert it to rivers and reservoirs in the valley so that it wouldn't evaporate and leave its salts in the soil.

But the farmers didn't realize that the rocks and soils of the region contained substantial amounts of the mineral selenium, which is toxic at high doses. Some of the selenium leached into the drainage water, which was routed to the region's wetlands. It wasn't until the mid-1980s that the aftermath of this solution became apparent: ecologists noticed that thousands of waterfowl in the nearby Kesterson Reservoir were dying of selenium poisoning.

Hydrological systems are not easy to outmaneuver, and the San Joaquin farmers' experience serves as a kind of cautionary tale. Each of their stopgap solutions temporarily took care of an immediate obstacle, but led to a longer-term problem more severe than the original one. "Human understanding has lagged one step behind the inflexible realities governing the aquifer system," observes USGS hydrologist Frank Chapelle.

Around the world, human responses to aquifer pollution thus far have essentially recreated the San Joaquin Valley farmers' well-meaning but inadequate approach. In many places, various authorities and industries have fought back the contamination leak by leak, or chemical by chemical—only to find that the individual fixes simply don't add up. As we line landfills to reduce leakage, for instance, tons of pesticide may be running off nearby farms and into aquifers. As we mend holes in underground gas tanks, acid from mines may be seeping into groundwater. Clearly, it's essential to control the damage we've already inflicted, and to protect communities and ecosystems from the poisoned fallout. But given what we already know—that damage done to aquifers is mostly irreversible, that it can take years before groundwater pollution reveals itself, that chemicals react synergistically, and often in unanticipated ways—it's now clear that a patchwork response isn't going to be effective. Given how much damage this pollution inflicts on public health, the environment, and the economy once it gets into the water, it's critical that emphasis be shifted from filtering out toxins to not using them in the first place. Andrew Skinner, who heads the International Association of Hydrogeologists, puts it this way: "Prevention is the only credible strategy."

To do this requires looking not just at individual factories, gas stations, cornfields, and dry cleaning plants, but at the whole social, industrial, and agricultural systems of which these businesses are a part. The ecological untenability of these systems is what's really poisoning the world's water. It is the predominant system of high-input agriculture, for example, that not only shrinks biodiversity with its vast monocultures, but also overwhelms the land—and the underlying water—with its massive applications of agricultural chemicals. It's the system of car-dominated, geographically expanding cities that not only generates unsustainable amounts of climate-disrupting greenhouse gases and acid rain-causing air pollutants, but also overwhelms aquifers and soils with petrochemicals, heavy metals, and sewage. An adequate response will require a thorough overhaul of each of these systems.

Begin with industrial agriculture. Farm runoff is a leading cause of groundwater pollution in many parts of Europe, the United States, China, and India. Lessening its impact calls for adopting practices that sharply reduce this runoff—or, better still, that require far smaller inputs to begin with. In most places, current practices are excessively wasteful. In Colombia, for example, growers spray flowers with as much as 6,000 liters of pesticide per hectare. In Brazil, orchards get almost 10,000 liters per hectare. Experts at the U.N. Food and Agricultural Organization say that with modified application techniques, these chemicals could be applied at one-tenth those amounts and still be effective. But while using more

Some Major Threats to Groundwater

Threat	Sources	Health and Ecosystem Effects at High Concentrations	Principal Regions Affected
Pesticides	Runoff from farms, backyards, golf courses; landfill leaks.	Organochlorines linked to reproductive and endocrine damage in wildlife; organophosphates and carbamates linked to nervous system damage and cancers.	United States, Eastern Europe, China, India.
Nitrates	Fertilizer runoff; manure from livestock operations; septic systems.	Restricts amount of oxygen reaching brain, which can cause death in infants ("blue-baby syndrome"); linked to digestive tract cancers. Causes algal blooms and eutrophication in surface waters.	Midwestern and mid-Atlantic United States, North China Plain, Western Europe, Northern India.
Petrochemicals	Underground petroleum storage tanks.	Benzene and other petrochemicals can be cancer-causing even at low exposure.	United States, United Kingdom, parts of former Soviet Union.
Chlorinated Solvents	Effluents from metals and plastics degreasing; fabric cleaning, electronics and aircraft manufacture.	Linked to reproductive disorders and some cancers.	Western United States, industrial zones in East Asia.
Arsenic	Naturally occurring; possibly exacerbated by over-pumping aquifers and by phosphorus from fertilizers.	Nervous system and liver damage; skin cancers.	Bangladesh, Eastern India, Nepal, Taiwan.
Other Heavy Metals	Mining waste and tailings; landfills; hazardous waste dumps.	Nervous system and kidney damage; metabolic disruption.	United States, Central America and northeastern South America, Eastern Europe.
Fluoride	Naturally occurring.	Dental problems; crippling spinal and bone damage.	Northern China, Western India; parts of Sri Lanka and Thailand.
Salts	Seawater intrusion; de-icing salt for roads.	Freshwater unusable for drinking or irrigation.	Coastal China and India, Gulf coasts of Mexico and Florida, Australia, Philippines.

Major sources: European Environmental Agency, USGS, British Geological Survey.

efficient pesticide applications would constitute a major improvement, there is also the possibility of reorienting agriculture to use very little synthetic pesticide at all. Recent studies suggest that farms can maintain high yields while using little or no synthetic input. One decade-long investigation by the Rodale Institute in Pennsylvania, for example, compared traditional manure and legume-based cropping systems which used no synthetic fertilizer or pesticides, with a conventional, high-intensity system. All three fields were planted with maize and soybeans. The researchers found that the traditional systems retained more soil organic matter and nitrogen—indicators of soil fertility—and leached 60 percent less nitrate than the conventional system. Although organic fertilizer (like its synthetic counterpart) is typically a potent source of nitrate, the rotations of diverse legumes and grasses helped fix and retain nitrogen in the soil. Yields for the maize and soybean crops differed by less than 1 percent between the three cropping systems over the 10-year period.

In industrial settings, building "closed-loop" pro-

duction and consumption systems can help slash the quantities of waste that factories and cities send to landfills, sewers, and dumps—thus protecting aquifers from leaking pollutants. In places as far-ranging as Tennessee, Fiji, Namibia, and Denmark, environmentally conscious investors have begun to build "industrial symbiosis" parks in which the unusable wastes from one firm become the input for another. An industrial park in Kalundborg, Denmark diverts more than 1.3 million tons of effluent from landfills and septic systems each year, while preventing some 135,000 tons of carbon and sulfur from leaking into the atmosphere. Households, too, can become a part of this systemic change by reusing and repairing products. In a campaign organized by the Global Action Plan for the Earth, an international nongovernmental organization, thoughtful consumption habits have enabled some 60,000 households in the United States and Europe to reduce their waste by 42 percent and their water use by 25 percent.

As it becomes clearer to decisionmakers that the most serious threats to human security are no longer those of military attack but of pervasive environmental and social decline, experts worry about the difficulty of mustering sufficient political will to bring about the kinds of systemic—and therefore revolutionary—changes in human life necessary to turn the tide in time. In confronting the now heavily documented assaults of climate change and biodiversity loss, leaders seem on one hand paralyzed by how bleak the big picture appears to be—and on the other hand too easily drawn into denial or delay by the seeming lack of immediate consequences of such delay. But protecting aquifers may provide a more immediate incentive for change, if only because it simply may not be possible to live with contaminated groundwater for as long as we could make do with a gradually more irritable climate or polluted air or impoverished wildlife. Although we've damaged portions of some aquifers to the point of no return, scientists believe that a large part of the resource still remains pure—for the moment. That's not likely to remain the case if we continue to depend on simply stepping up the present reactive tactics of cleaning up more of the chemical spills, replacing more of the leaking gasoline tanks, placing more plastic liners under landfills, or issuing more fines to careless hog farms and copper mines. To save the water in time requires the same fundamental restructuring of the global economy as does the stabilizing of the climate and biosphere as a whole—the rapid transition from a resource-depleting, oil- and coal-fueled, high-input industrial and agricultural economy to one that is based on renewable energy, compact cities, and a very light human footprint. We've been slow to come to grips with this, but it may be our thirst that finally makes us act.

"Heaven is Under Our Feet"

Throughout human history, people have feared that the skies would be the source of great destruction. During the Cold War, industrial nations feared nuclear attack from above, and spent vast amounts of their wealth to avert it. Now some of that fear has shifted to the threats of atmospheric climate change: of increasing ultraviolet radiation through the ozone hole, and the rising intensity of global warming-driven hurricanes and typhoons. Yet, all the while, as the worldwide pollution of aquifers now reveals, we've been slowly poisoning ourselves from beneath. What lies under terra firma may, in fact, be of as much concern as what happens in the firmament above.

The ancient Greeks created an elaborate mythology about the Underworld, or Hades, which they described as a dismal, lifeless place completely lacking the abundant fertility of the world above. Science and human experience have taught us differently. Hydrologists now know that healthy aquifers are essential to the life above ground—that they play a vital role not just in providing water to drink, but in replenishing rivers and wetlands and, through their ultimate effects on rainfall and climate, in nurturing the life of the land and air as well. But ironically, our neglectful actions now threaten to make the Greek myth a reality after all. To avert that threat now will require taking to heart what the hydrologists have found. As Henry David Thoreau observed a century-and-a-half ago, "Heaven is under our feet, as well as over our heads."

Payal Sampat is a staff researcher at the Worldwatch Institute.

A Few Key Sources

Francis H. Chapelle, *The Hidden Sea: Ground Water, Springs, and Wells* (Tucson, AZ: Geoscience Press, Inc., 1997).

U.N. Environment Programme, *Groundwater: A Threatened Resource* (Nairobi: 1996).

European Environmental Agency, *Groundwater Quality and Quantity in Europe* (Copenhagen: 1999).

U.S. Geological Survey, *The Quality of Our Nation's Waters—Nutrients and Pesticides* (Reston, VA: 1999).

British Geological Survey et al., *Characterisation and Assessment of Groundwater Quality Concerns in Asia-Pacific Region* (Oxfordshire, UK: 1996).

C. Savage

Dorothy M. Moore
Three Creek Farm, 71 Wolfram Road, Weldon Spring, Missouri 63304
(636) 441-3609

August 14, 2000

Mr. Stephen H. McCracken, Project Mgr.
Weldon Spring Site Remedial Action Project
7295 Highway 94 South
St. Charles, Mo. 63304

Dear Mr. McCracken;

Pleases accept this as my response to the request for Public Comment concerning the review of the proposed plan for remedial action for the groundwater operable unit at the chemical plant area of the Weldon Spring Site

Without further delay or more study and discussion, I believe the Department Of Energy Should follow through with their original intent to remove all Hazardous Material that could possibly result in further contamination of the groundwater in the area---- Ever!

This problem has gone on far too many years, and is a matter of such major importance and far reaching consequences, it should be a deep concern for everyone living and/or working in St. Charles County. Each new study uncovers new alarming facts on the hazards of nuclear toxins, migration of radioactive particles, contaminants in groundwater etc. I don't believe we have even begun to scratch the surface of all there is to know, or to someday be known about the matters we are dealing with, nor can we grasp the concept of the eternity of time involved. Meantime, we, who are in positions to make decisions now, have no right to endanger the health, welfare and environment of present and future generations, gambling on unknown speculation.

I am enclosing a copy of the letter Kay Drey wrote you last September in response to the first deadline for Public input,(which of course you already have,) It is such an excellent letter, so well written and researched, and states the facts so far beyond my expertise., I can only say, please add my endorsement and let it speak for me as well. I have also included some recent articles, which you may or may not already have seen. I found them very interesting. ---also a copy each of the resolutions passed by the St. Louis County Council June 29, 2000 and the St. Louis Board of Aldermen July 7, 2000

On a personal level – you may remember; we live on the north bank of the Missouri River about one mile east of the "southeast drainage ditch", referred to on Page 3 of Ms. Drey's enclosed letter. There are three creeks on our property, two deep wells (700ft plus), four springs, and several sink holes. With Karst a major ingredient of the subsoil, we are, indeed concerned with the composition of run-off ground water.

Again, given the potential for serious disaster, it's hard to believe a final resolution of this problem should have dragged on for so many years! Please do your best to help bring it to closure.

Thanks — Sincerely

Dorothy M. Moore

Dorothy M. Moore

C. Savage

August , 2000

Mr. Stephen McCracken, Project Manager
Weldon Spring Site - Department of Energy
7295 Highway 94 South
St. Charles, Mo. 63304
Fax 1-636-447-0739

Re: Clean up of Weldon Spring Radioactive Groundwater

Dear Mr.McCracken:

I am writing as a concerned citizen, requesting that clean-up efforts at Weldon Spring include clean-up of the groundwater to safe drinking water standards.

It is my understanding that DOE is proposing to only treat the groundwater for trichloroethylene (TCE) with no guarantee that this will be continued until acceptable standards are reached. Also, DOE proposed NO treatment for the radioactive contamination (uranium) or the explosives waste in the aquifer. I understand that technologies are available that can remove much of the radioactive and hazardous waste from the groundwater. I consider it essential that these current technologies be applied to eliminate the hazards at this site.

Sincerely,

Ellen Sue Goodman
ELLEN SUE GOODMAN
12892 CASTLETON LN
ST LOUIS, MO 63141

C. Stadler

St. Charles County

Division of Environmental Services
201 North Second Street, Room 433
St. Charles, MO 63301
Phone: 636-949-7415
Fax: 636-949-7519
Web: www.scchealth.org E-mail: environ@mail.win.org

FAX TRANSMISSION COVER SHEET

Date: *August 15, 2000*

To: *Stephen McCracken, Project Manager, WSSRAP*

Fax: *636-447-0739* *Phone: 636-441-8978*

Re: *Comments -- Proposed Plan for Remedial Action for GOU #1 at WS Site*

Sender: *Mike Duvall, Director*

YOU SHOULD RECEIVE 3 PAGE(S), INCLUDING THIS COVER SHEET. IF YOU DO NOT RECEIVE ALL THE PAGES, PLEASE CALL 636-949-7415.

St. Charles County Government

Department of Community Health
and the Environment
Gil Copley, Director
Division of Environmental Services
Mike Duvall, Director

August 15, 2000

Mr. Stephen H. McCracken, Project Manager
Weldon Spring Site Remedial Action Project
7295 Highway 94 South
St. Charles, MO 63304

Re: Comment Period for Proposed Plan for Remedial Action for Groundwater Operable Unit #1 at Weldon Spring Site

Dear Steve:

In response to the comment period for the proposed plan for remedial actions at WSSRAP, and to USEPA's May 12, 2000 final decision regarding the dispute resolution process, St. Charles County Division of Environmental Services appreciates the opportunity to offer the following guidance and position.

Presently, there does not appear to be sufficient information compiled for treating the contaminated groundwater to predict how certain remedies would actually perform. We would like to see full consideration given to estimating restoration potential of the groundwater. We feel the information presented in the MDNR-DGLS document prepared by Dr. Jim Williams dated March 10, 2000 discussing the premature termination of pump testing in October of 1998 provides compelling rationale for reconsideration of the proposed treatment of the remaining groundwater contamination. We concur with the stated MDNR position on the subject.

The Remedial Investigation and Feasibility Study is a guide process and subject to interpretation by all stakeholders. EPA-Region Seven states (*EPA, Dennis Grams, 05-12-00, p.3,* ref: which remediation to choose) interprets the RIFS guidelines as "not to exhaust all avenues for data gathering to define performance of a remedial alternative. Rather, its purpose is to gather sufficient information to put boundaries on performance and allow an estimate of restoration potential." Dr. Williams states this was not achieved by DOE during its investigation period. We believe this interpretation by Administrator Grams may suffice in some CERCLA projects, but may require more flexibility at WSSRAP.

We also request that full consideration be given to on-site post-construction management and long term stewardship issues. This plan should exist as a proactive detailed design, more so than a contingent, reactive response. The stewardship plan should identify all parties responsible for stewardship activity, local office locations and describe their control obligations including activity time frame projected for the foreseeable future.

201 North Second Street • Suite 433 • St. Charles, MO 63301
Phone: 636-949-7415 • Fax: 636-949-7519

St. Charles County, along with the State, is also interested in future damage assessments and compensation for injuries to natural resources at and beyond the WSSRAP site. The County is in a position to act as one of the Trustees for the State, if so needed, and welcomes DOE's commitment to meeting the requirements of the Natural Resources Damages Act following cessation of remediation activities.

We appreciate the extensive time and effort spent in compiling the information presented to us and look forward to a proposed groundwater remediation and stewardship plan that reflects the best interests of the public and environment of St. Charles County. We likewise acknowledge and commend DOE on the overall remedial WSSRAP progress completed and documented to date.

Sincerely,

M. Duvall SLL for MD

Mike Duvall, CHMM
Director, Division of Environmental Services

MD/MH/sll

cc: Joe Ortwerth, County Executive
Gil Copley, Director, St. Charles County Department of Community Health and the Environment
Robert Geller, Federal Facilities Section Chief, MDNR-HWMP
Glenn Hackey, Chair, Weldon Spring Citizens Commission

C Savage

3307 Laclede Ave.
St. Louis, MO 63103-2010
314-977-3900
FAX: 314-977-3658

SAINT LOUIS
UNIVERSITY

Department of Biology

August 15, 2000

Mr Stephen McCracken
Project Manager, Weldon Spring Site
US Department of Energy
7295 Highway 94 South
St. Charles, MO 63304

Dear Mr. McCracken:

I wish to protest the intention of the DOE to **shut down its cleanup program** of the radioactively contaminated groundwater from the Mallinkrodt Chemical Works at Weldon Spring. Although I am speaking as an individual, my scientific background has taught me that the effects of environmental insults on the human body are often silent and the potential danger is easily misjudged. Compared to the amount of money that was spent on development of uranium and thorium for nuclear weapons and the cost of building and deploying them, how can the DOE say the cleanup effort is not cost-effective? What is our health and the health of our children worth? Water from the Weldon Spring site flows into the Missouri River and eventually into the water we all drink and neither I, nor anyone else, knows exactly how it will impact our health and that of our unborn children. The dangers of radiation exposure, even in small amounts, that were not deemed dangerous in the past, now have proved to be life-threatening; I see reports in the newspapers frequently about the lethal effects of exposure to contaminants which were not considered hazardous by the US government at the time. If the citizens of the state were to be informed of the possible future risks, would they consider cost-effectiveness a legitimate concern? I'm sure they would want radioactive-free, noncontaminated water no matter what the price.

The other objections of the DOE to cleaning up the contaminated ground water is that it is "technically impracticable". Technological advancement in our society is evident every day especially in terms of communication, computers, etc. If the scientific community were aware of the need for improved water treatment methods and were given incentives for development of improved technology, there is no doubt that it could be accomplished. Do not close the door to clean, noncontaminated water; it is far more important than many other environmental issues and deserves our best shot. The stunning technological expertise that exists today surely can come up with ways to reduce the hazards of the groundwater at the Weldon Spring site and the citizens of Missouri want and deserve water that will not make them ill in the future.

Sincerely yours,

Judith Medoff

Judith Medoff, Ph.D.
Professor of Biology

August , 2000

Mr. Stephen McCracken, Project Manager
Weldon Spring Site - Department of Energy
7295 Highway 94 South
St. Charles, Mo. 63304
Fax 1-636-447-0739

Re: Clean up of Weldon Spring Radioactive Groundwater

Dear Mr.McCracken:

I am writing as a concerned citizen, requesting that clean-up efforts at Weldon Spring include clean-up of the groundwater to safe drinking water standards.

It is my understanding that DOE is proposing to only treat the groundwater for trichloroethylene (TCE) with no guarantee that this will be continued until acceptable standards are reached. Also, DOE proposed NO treatment for the radioactive contamination (uranium) or the explosives waste in the aquifer. I understand that technologies are available that can remove much of the radioactive and hazardous waste from the groundwater. I consider it essential that these current technologies be applied to eliminate the hazards at this site.

Sincerely,

Mary T. Dziennik
5059 Potomac St
St. Louis, Mo 63139

024631
AUG 15 2000

COMMUNITY ACTION ADVISORY

RE: WELDON SPRING RADIOACTIVE GROUNDWATER

The St. Louis County Council and St. Louis Board of Alderman have unanimously passed resolutions requesting more time for public comment on the WELDON SPRING GROUNDWATER. In response the US Department of Energy has extended the deadline until **TUESDAY, AUGUST 15**. **Your written comments are needed!**

Unless citizens insist on it, the Department of Energy (DOE) may leave the Weldon Spring Superfund site without cleaning up the groundwater under the site of its radioactive contamination. DOE has spent about one billion dollars to contain the wastes in a bunker on site. Contaminants have made their way to the underlying aquifer. DOE is proposing to only treat the groundwater for trichloroethylene (TCE) with no guarantee that this will be continued until acceptable standards are reached. DOE proposes NO treatment for the radioactive contamination (uranium) or the explosives waste in the aquifer.

The Missouri Coalition for the Environment believes that the Department of Energy must clean up all sources of contamination in the groundwater until drinking water standards are met.

The geology of the area is limestone karst -- a Swiss-cheese topography of sinkholes, underground streams, and porous rock that allows for easy migration of contaminants into underlying aquifers. Water from the Weldon Spring site flows into the Missouri River nine miles upstream from major St. Louis City and County drinking water intakes, and flows into the Dardenne Creek and St. Charles county drinking water sources as well. **So the water we all drink is in jeopardy**. Also, high-use recreational areas lie within or adjacent to Weldon Spring, including Katy Trail and Busch Wildlife area fishing lakes.

Technologies ARE available that can remove much of the radioactive and hazardous waste from the groundwater. It is essential that current technologies be applied to eliminate the hazards at this site.

PLEASE LET YOUR VOICE BE HEARD!

WRITE TO THE DEPARTMENT OF ENERGY REQUEST THAT CLEAN-UP EFFORTS AT WELDON SPRING INCLUDE CLEAN-UP OF THE GROUNDWATER TO SAFE DRINKING WATER STANDARDS.

Written comments must be postmarked or faxed by Tuesday, August 15, to:
Mr. Stephen McCracken, Project Manager; Weldon Spring Site - DOE
7295 Highway 94 South, St. Charles, MO 63304 FAX: 1-636-447-0739

For information: Missouri Coalition for the Environment 314-727-0600 or Kay Drey 314-725-7676

HELP TAKE A STAND FOR THE HEALTH AND WELL-BEING OF EVERYONE IN OUR AREA COMMUNITIES.

7425 Teasdale
St. Louis, Mo. 63130

Mr. Stephen McCracken
Project Manager
Weldon Spring Site – DOE
7295 Highway 94 South
St. Charles, MO 63304

Dear Mr. McCracken:

For the past forty-five years of my life, the Weldon Spring recreational area has played a major role in shaping my love of the outdoors. When I was a young child, my father would take me there to "run the dogs" he trained for quail hunting. I knew nothing of guns and flying targets, but I loved to wade in the creeks there and explore the damp world of the old bunkers where frogs and salamanders hung out. In high school, I fished the many lakes and ponds with my cousins; again more interested in watching flocks of Canadian geese land on a glassy lake than in catching "sunnies." Later, hiking became my favored activity. And more recently, the beauty of the Katy Trail along the Missouri River has made Weldon Spring one of my family's favorite biking spots.

But I have a confession to make. Each and every time I pass the high school along Highway 94, eat the lunch along the Missouri River, and bike with my husband and children near a treated wastewater exit pipe, I am worried and I am sad. When I was a child, I didn't know what radioactive groundwater was, nor that it lay under my feet as I tramped the Weldon Springs forests. Now I know.

I applaud the DOE's efforts thus far to clean up the deadly mess our country made in our backyard over half a century ago. You have worked long and hard to accomplish what you have for the sake of not only our generation, but also the generations to come. But more must be done. You have said it is technically impractical and not cost-effective to clean up the Weldon Spring groundwater. Yes, it might be costly, but it is not impractical.

According to one environmental engineer I consulted at the State University of New York at Buffalo, the migration of the contaminants via the groundwater movement CAN be prevented. There are a variety of new technologies available which can be used to prevent migration of the plume. Also, simply pumping and treating the groundwater might be costly, but it is still the best method of containing the plume.

So why leave the groundwater as is? For the sake of the thousands of people who will enjoy the Weldon Spring forests, creeks, and river in the centuries to come, I implore you to reconsider your decision to ignore the effects of radioactive and hazardous

024638
AUG 15 2000

groundwater continuing to migrate for years throughout the Weldon Spring watershed. Our Missouri Department of Natural Resources disagrees with your decision. Because I want to be able to take my family to Weldon Springs in safety, I disagree as well. Please, clean up our contaminated groundwater.

Sincerely,

Saundra A. Lowes

Saundra A. Lowes

Aug 11, 2000

Dear Ms. McCracken,

We are thankful that Weldon Springs nuclear waste site is finally being addressed and "cleaned up" after all these years.

At same the D.O.E. is doing a reasonable job of containing these dangerous contamination. However the job will never be finished until the groundwater in the area is also addressed. I have a friend that lives on Wolfrum Road that had a number of miscarriages in the 1980s. She blames them on their well water they use to drink.

We are all concerned about our drinking water and are all concerned about the

ground water that flows into the river above the St. Louis City & County intakes.

-- Please continue the clean up of this site until the job is truely complete.

Sincerely,

Pamela Sobrowski
8 Fair Oaks
St. Louis Mo 63124

Mary A. Halliday
97 Wildlife Lane
Defiance, MO 63341-1512
636 398-5320 mhalliday@mail.win.org

Sunday, August 13, 2000

Mr. Steve McCracken, Project Manager
Weldon Spring Site Remedial Action Project
7295 Highway 94 South
St. Charles, MO 63304

Dear Steve,

After all these years of progress and skillful management choices at WSSRAP, it is quite puzzling to me to see what appears to be a somewhat compressed and brisk finish being proposed by DOE and EPA to the final cleanup activities at WSSRAP.

As an eternally interested WSSRAP citizen, I am concerned that, through "natural attenuation" the existing contaminated groundwater will in some year, find its way to places it never should have gone to. With a more thorough treatment system now, the chances for this happening in the future will be lessened.

For this reason I fully support a more thorough investigation of ways to pump and treat the contaminated water in accordance with MDNR-DGLS Dr. Jim Williams March 10, 2000 letter. I believe "natural attenuation" to be an original misnomer. Actually it is called "Dilution of the pollution".

Burgermeister Spring should have a passive treatment system installed until such time that tests determine sources of contamination leading to Burgermeister have been depleted. Then the passive treatment system can be removed.

Thank you for the extensive time and effort you have spent since 1984 in cleaning up this site. Just one more request.....slow down now and do it right, so future citizens of St. Charles County need not do another cancer study in the year 2025 as we did in 1984.

Sincerely,

Mary A. Halliday

Mary A. Halliday
Citizen
97 Wildlife Lane
Defiance, MO 63341

024632
AUG 15 2000

Aug 13 2000

Stephen McCracken, Project Mgr
Weldon Site Remedial Action Project
7295 Hwy 94 South
St Charles MO 63304

Dear Mr. McCracken,

I a writing to strongly encourage you to complete your work at the Weldon Spring site in a manner that will allow the surrounding communities to live and develop without fear of groundwater contamination from the site. That includes treating the groundwater for radioactive contamination and explosives waste. It would be a shame to have accomplished so much at the Weldon Spring site and then leave this critical element unfinished. Please reconsider your plans to end the remedial action without full groundwater cleanup.

Sincerely, Carol Pufait

Caroline Pufait
13415 Land O Woods #3
Chesterfield MO 63141 6078

024633
AUG 15 2000

8-14-00
26 Rolling Rock Ct.
St. Louis, MO 63124

Stephen McCracken, Proj. Mgr.
Weldon Spring Site Remedial Action
7295 Hwy 94 South
St. Charles, MO 63304

Dear Mr. McCracken,

I am writing in regard to my concern regarding the possibility that the DOE may not clean all contaminated groundwater, to meet drinking water standards.

I feel voluntary damage has been done to our environment needs to be rectified to the full extent — to maintain its original condition.

You would do a great injustice to leave the groundwater contaminated — for someone else to correct for further use of the area.

Sincerely,
Pat Harrison

024634
AUG 15 2000

346 Woodmere Dr.
St. Charles, Mo 63303
August 11, 2000

Dear Mr. McCracken,

I want to express my strong dissatisfaction with the Energy Department's groundwater treatment plan. It would be irresponsible to proceed with your present plan. The contaminated groundwater must be pumped out and treated. Your own test results indicate 20 times the naturally occurring level of uranium in the area.

Also, I want to know why this information was not presented to the public before now. I did not see such information in either the St. Charles Journal or the St. Charles Post-Dispatch. It was only in this Sunday's Metro Section and public comment must be sent to you by Tuesday. Is this the Department's way of keeping public comment to a minimum? This is a very deceitful tactic. I intend to contact the St. Charles bureau of the Post and let them know about this. At the very least, you should extend the deadline for public comment and get this information out to the public. You should be ashamed of yourself.

Once again, I want to reiterate my strong opposition to your current plan. The contaminated groundwater must be pumped up and treated.

Sincerely,

Debbie Cole

Debbie Cole

024635
AUG 15 2000

August 14, 2000

Dear Ms McCracken,

I am concerned about the contaminated ground water at Weldon Spring. I do not feel it is justified for the Dept of Energy to walk away and leave it primarily because it is difficult to pump out and clean. We are all aware that ground water moves significantly over time. Therefore, it is not acceptable to just leave it and allow the contamination to spread who-knows-where. If that happens, it would be much more difficult, if not impossible to determine origin and responsibility. That is not what we should be leaving to future generations. The Dept of Energy should accept the responsibility now while it is at least possible.

Please do what you can to clean up this dangerous legacy. Pump it out and clean it up.

Sincerely,

Fran Sontag
6671 Kingsbury
St Louis, Mo 63130

024636
AUG 15 2000

634 Sherwood Drive
Webster Groves, MO
63119
314/962-6023
August 12, 2000

Stephen McCracken
Project Manager
Weldon Spring Site
Remedial Action Project
7295 Hwy. 94 South
St. Charles, MO 63304

Re: Proposed Plan for Remedial Action for the Groundwater Operable Unit at the Weldon Spring Site

Dear Mr. McCracken:

The U.S. Department of Energy should cleanup all sources of contamination, especially uranium, in the groundwater at Weldon Spring until drinking water standards are met. The DOE must not end its remedial efforts until the groundwater is completely cleaned up of all contaminants.

Yours truly,

Kathleen O'Keefe

Kathleen O'Keefe

024637
AUG 15 2000

Janet and Bernard Becker
4498 Laclede Ave.
St. Louis, MO 63108

August 14, 2000

Mr. Stephen McCracken, DOE
Project Manager of Weldon Spring
7295 Highway 94 South
St. Charles, MO 63304

Dear Mr. McCracken:

I want to add my concerns to those who contact you about the cleanup at Weldon Spring. I think what you have done so far is a good beginning. But I worry a lot about groundwater contamination. The risk is too high to stop the cleanup at this point. We cannot afford to have water that is unsafe to drink, spreading for miles. Without doing the whole job right, your $1 billion investment may well go down the proverbial drain!

Sincerely,

Janet Becker

024639
AUG 15 2000

ST. PETERS

THOMAS W. BROWN
MAYOR
(636) 477-6600, EXT. 200

August 14, 2000

Mr. Stephen McCracken, Project Manager
Weldon Spring Site - DOE
7295 Highway 94 South
St. Charles, MO 63304

Re: Weldon Spring Site Remedial Action Project – Public Comment

Dear Mr. McCracken:

It has come to my attention that the Department of Natural Resources (DNR) disagrees with the Department of Energy's (DOE), approach for leaving contaminated groundwater in place at the Weldon Spring remediation site and only to monitor the migration of the contaminants.

It is my understanding that the DOE will attempt to treat the trichloroethylene (TCE) in the groundwater, but due to conditions underlying the site, the other contaminants (nitrate, uranium, and DNT) will not be remediated, but only monitored. However, it is also my understanding, that the DNR believes conditions underlying the site are favorable for treating these contaminants.

As mayor of a community that is downstream of the site, I am greatly concerned that the DNR, whose role is to ensure that the remediation protects the interests of the citizens of Missouri, strongly disagrees with the DOE's approach to only monitor and not remediate the contaminated groundwater.

The City of St. Peters strongly recommends that further evaluation or pilot studies be conducted to confirm that all remediation options have been explored to reduce all health and environmental hazards to the lowest risks possible.

Sincerely,

Thomas W. Brown
Mayor

cc: Board of Aldermen

024622
AUG 15 2000

August , 2000

Mr. Stephen McCracken, Project Manager
Weldon Spring Site - Department of Energy
7295 Highway 94 South
St. Charles, Mo. 63304
Fax 1-636-447-0739

Re: Clean up of Weldon Spring Radioactive Groundwater

Dear Mr.McCracken:

I am writing as a concerned citizen, requesting that clean-up efforts at Weldon Spring include clean-up of the groundwater to safe drinking water standards.

It is my understanding that DOE is proposing to only treat the groundwater for trichloroethylene (TCE) with no guarantee that this will be continued until acceptable standards are reached. Also, DOE proposed NO treatment for the radioactive contamination (uranium) or the explosives waste in the aquifer. I understand that technologies are available that can remove much of the radioactive and hazardous waste from the groundwater. I consider it essential that these current technologies be applied to eliminate the hazards at this site.

Sincerely,

Laura Ellsworth

024623
AUG 15 2000

August 14, 2000

Mr. Stephen McCracken, Project Manager
Weldon Spring Site - Department of Energy
7295 Highway 94 South
St. Charles, Mo. 63304
Fax 1-636-447-0739

Re: Clean up of Weldon Spring Radioactive Groundwater

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Sincerely,

024624
AUG 15 2000

August , 2000

Mr. Stephen McCracken, Project Manager
Weldon Spring Site - Department of Energy
7295 Highway 94 South
St. Charles, Mo. 63304
Fax 1-636-447-0739

Re: Clean up of Weldon Spring Radioactive Groundwater

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Sincerely,

Jerri Goodwin

024625

AUG 15 2000

August 14, 2000

Mr. Stephen McCracken, Project Manager
Weldon Spring Site - Department of Energy
7295 Highway 94 South
St. Charles, Mo. 63304
Fax 1-636-447-0739

Re: Clean up of Weldon Spring Radioactive Groundwater

Dear Mr.McCracken:

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It is my understanding that DOE is proposing to only treat the groundwater for trichloroethylene (TCE) with no guarantee that this will be continued until acceptable standards are reached. Also, DOE proposed NO treatment for the radioactive contamination (uranium) or the explosives waste in the aquifer. I understand that technologies are available that can remove much of the radioactive and hazardous waste from the groundwater. I consider it essential that these current technologies be applied to eliminate the hazards at this site.

Sincerely,

Thelma J. Schaefer

024626

AUG 15 2000

Mary Lou S. Ryan
6 Wakefield Dr.
St. Louis, Mo. 63124
Aug. 12, 2000

Stephen McCracken
Project Manager
Weldon Spring Site Remedial Action Project Office
7295 Hwy. 94 South
St. Charles, Mo. 63304

Dear Mr. McCracken,

I write to urge the Department of Energy to reconsider its decision to clean up only Trichloroethylene from the ground water leaving behind the uranium and related radioactive contaminates nitroaromatics and nitrates. Because all of these could adversely affect human health and environmental safety I believe the D. of E. has an obligation to clean up all the contaminates that resulted from weapon manufacture intended to make our lives "safer."

Thank you for reading my concerns,

Mary L.S. Ryan

024628
AUG 15 2000

August 14, 2000

Stephen McCracken
Weldon Spring Site Remedial Action Proj.
7295 Highway 94 South
St. Charles Mo 63304

Dear Mr. McCracken:

I agree with the state geologist for the Mo Dept of Natural Resources that injecting a chemical to break down one component of toxic substances is not enough.

The Weldon Spring nuclear weapons site needs additional effort - you need to pump out the ground water and treat it.

I take exception to Mr Pauling's statement that there's no health risk to anyone who would access that water "based on the current use of the land".

If you don't take care of the problem now, the contaminated water could easily cause catastrophic problems later.

Sincerely,

Dorothy C Poor
8173 Stratford Dr.
St Louis Mo 63105

024629
AUG 15 2000

Dear Mr. McCracken,

I am writing to let you know how outraged I was to learn about the radioactive contaminated groundwater at Weldon Springs. To let this go untreated is negligent, irresponsible, and reprehensible. Please do something.

Sincerely,

Wendy Kahn

C. Stokage

Helene Frankel
116 Lake Forest
St Louis, MO 63117

Tuesday, August 15, 2000

Mr. Steven McCracken
Project Manager
Weldon Spring Site - DOE
7295 Highway 94 South
St. Charles, MO 63101

Dear Mr. McCracken:

I have been following the cleanup of the Weldon Springs site. You have spent an incredible amount of time, energy, and money trying to undo problems not anticipated, not acknowledged, and not easily solved. I respect the diligence with which you and your team has approached this job. However, I worry about declaring the project finished before the issue of the contamination of the water is resolved.

Water is the lifeblood of each person as well as of this region. Our strategic importance as a community has always been our location at the confluence of so many rivers and streams, providing easy access to water for transportation, irrigation, fishing, recreation, and the most basic need... drinking. Because of the area's karst geology, the radioactive material can easily migrate to the Missouri River, contaminating our regional drinking water and continue downstream to affect the even larger area of the Mississippi basin, the Gulf of Mexico, and beyond. This is a grave responsibility. The DOE should actively pursue any technology developed to address the decontamination or containment of the affected groundwater or fund the research and development of such technology if not currently effective. This is the last, but to me, a most significant problem. Better to spend this money to prevent future and unknowable health consequences to all species, especially humans. While it only took 40 years to create this toxic site, it will take 4.5 billion years ten times over to break it down. These half-lives sound like forever to me. Not the legacy to leave the world after you leave your job not completely done.

Sincerely,

Helene Frankel

C. Stoze

Garth F. Fort
31 Briarcliff
St. Louis, MO 63124
August 15, 2001

Mr. Stephen McCracken, Project Manager
7295 Highway 94 South
St. Charles, MO 63304

Dear Mr. McCracken,

As a result of a meeting that I attended in St. Peters this past week, several person friends have asked that I give them my personal comments on the DOE plans relative to he Groundwater Remediation plans subject to public comment ending today. Short as the time was, I felt that I should reflect on the matter for personal reasons as well in that I frequent the Dardenne Creek Watershed and drink well water from private wells in St. Charles County. In addition, I have some personal responsibilities for employees in the area drinking from private wells.

Background and premises for my comments:

Contacts made:

Time being short , I got on the phone and asked for certain information. The response that I got to the person was most somewhat amazing in light of my timing needs. The open and frank discussions were impressive and most helpful. Clearly, the channels of communications have been open for years on this subject and significant agreement reached on many major sub-issues. Specifically, the contacts made include:

1. Kay Drey - Citizen (314) 725-7676
2. Tom Pauling - DOE Project Weldon Springs Site (636) 926-7051
3. Yvonne Deyo - DOE Project Weldon Spring Project PAI, Corp. (636) 926-7034
4. Larry Erickson- Mo. Dept of Natural Resources (573) 751-4121
5. Gene Gunn - U.S. EPA Region IV Kansas City, KS (913)551-7776
6. Dan Wall- U.S. EPA region VI Kansas City, KS (913)551-7710
7. Other toxicologist , geologists, project managers not in public service

The opinions and comments are my own and in no way do I suggest that they are those of those listed above.

Some of my understandings /premises that relate to my opinions:

1. The risk model used is for a recreational hiker...400 ml of water consumed from on site wells per visit, 20 visits per year , 4 hrs per visits and some 20 + years of visits.

2. Federal Drinking Water Standards for Radionuclides:
   - Gross alpha .....15 pCi/liter
   - Man-made beta..... 4 millirems/yr
   - Radium 226 and 228 ..... 5 pCi/liter

   Noted: The Uranium Standard for drinking water has not been finalized.
   Proposed levels ?? 14 pCi/liter.

3. Limited field sampling data of any type (I know of no private well water data) has been collected in the Dardenne Creek watershed in the area between the Weldon Springs Chemical Plant site and the Mississippi River (City of St. Peters, etc.) {Will refer to this area as the "St. Peters Region" elsewhere in this report.)
   The data that was produced is attached as Appendix A . It shows Stream Sediment Sampling for Schote Creek, Burgemeister Spring Stream, and related tributaries to Dardenne. The samples show either ND(Non- detect) or low levels (Max 1.9 Ci/liter uranium), one sample having total of 3.1 pCi/liter --Radium-226, Thorium-230 and thorium232.

4. Although groundwater from the Weldon Spring site enters surface water from springs like the Burgemeister Spring and there is a hydraulic connection between groundwater at the site and Dardenne Creek, Project Management has not felt that a "Exposure Model is needed for the people in the "St. Peters Region."

5. Analyses of water from Burgemeister Springs (1999) indicate total uranium levels ranging from 30.7 to 82.1 pCi/liter.

6. All parties seemed to agree on the high quality of work relative to surface clean-up and "bunker construction and material fixation process." The storm water run off levels have come down significantly (600 +pCi/l to around the average of 10 pCi/l). The reduction of these losses to the Dardenne Creek water shed possibly over shadow the loading from springs and groundwater flow farom the site today.

7. The Project surface water treatment project proved the effectiveness of the unit process involved and gave real world data (cost and effectiveness) of each step ..equalization, pH adjustment , polymer flocculent addition for participation, , activated carbon treatment, etc.

8. The present groundwater plan includes extensive ground water monitoring.

9. The present plan speaks to some contingencies in case the monitoring wells indicate unsafe level of contaminants.

10. The karst hydrological environment typically make groundwater pump and treat projects difficult if not technical impracticable. Reportable, numerous vendors have said that such is the case here. Computer modeling

10.(cont.) has suggested the same conclusion. No pilot plant work has been attempted to validate these statements. In a March 10,2000 letter to Region VII U.S. EPA Administrator Mr. Dennis Grams, P.E, James Williams ((Div. Of Geology and Land Survey, State of Missouri stated " In summary, the DOE has not shown that meaningful amounts of contaminated groundwater is infeasible."

11. With some, there remain questions as to the safety of people in the St. Peters Region- what about the dust that exists on playgrounds and ball fields after the flooding of Dardenne Creek... that dust is inhaled and even if it is just alpha radiation, is there not significant risk... The radiation sources could come from past surface water runoff from he site, from ground water via springs or hydraulic connections to the creek? What about irrigation water from shallow wells ? What about drinking water wells in the "St. Peters Region"? Are they contaminated now??

12. Is it not a fact that the present plan basically says that nothing of significance (additional project work) will be even considered until the five year re-opener?

13. Excellent efforts have been made to get closure on "open issues" that exist between Region VII folks , the state DNR folks and DOE. Some issues still are open:
    - -Pilot-scale for groundwater pump and treat
    - -Remediation be augmented by passive treatment systems in the springs
    - -EPA's stance that the water quality of the springs already meets acceptable level of potential risks. With time, the level of contaminants should decrease.
    - -Some concerns as to how institutional controls are monitored/enforced
    - - Firm commitment that DOE will fund MDNR to perform all perpetual site surveillance and oversight and to conduct an assessment of natural resources injuries at the site.

14. In-situ oxidation of the TCE is included in plan.

15. Have the fish in Dardenne Creek ever been sampled for contamination? Has a fish advisory been considered or evaluated for St. "Peters Region?" (Groundwater migration effects on Dardenne Creek and a possible exposure route."

16. Storm water run off goals are set by DOE and exempt from State of Missouri Water Regulations. The goals set by DOE have been met and exceeded.

17. The Potentiometric surface maps substantiate the fact that groundwater from the contaminated areas flow toward and out of springs like Burgemeister Spring which in turn end up in Dardenne Creek.

18. Tom Pauling has spoken to the difficulty of pumping out water from the region because of the rock formation.

With this rather limited understanding of the project and all the issues, I offer these comments for consideration.

1. In spite of DOE's possibly having "sound engineering practices" on their side, it may be useful to take some samples of Dardenne Creek bottom sediments (core drillings to get some profile that might discover contaminates from the past, some private wells in the area, and some sallow wells representative of those used for irrigation, and even some samples from ball fields and residential properties. The logic for addressing now is related to the possible effects that groundwater losses might have and on this watershed.

   DOE could open the "window for interested parties" for a limited time to request sampling. Another approach is simply to more sampling than the 10-12 samples done in 1988-89 time frame.

   This step could answer clearly to all, "Are the people in this "St. Peters Region" at risk today."

   (This area is down gradient ..groundwater speaking ...from the site, hence its connection to the present proposal)

2. The suggestion of doing some pilot plant work relative to removing the man-made radiation from the springs would demonstrate the desire to drive "continuous improvement of technology" drawing on the site specific expertise that has been developed on site.

   This action would demonstrate the ongoing commitment of DOE to continue efforts to accelerate the reduction of radioactive releases... even though technically those releases are safe. (Technology driven effluent standards are the underpinning of the Water Act.)

   The cost of further clean-up vs. ultimate benefits... (public acceptance of closure plan, cost break-throughs for future projects around the worlds, etc. are somewhat thorny as always.

I offer these simple suggestions as possible ways to get more facts in the game, to drive continuous improvement in technologies which will benefit all in the future, and to reduce the anxiety for those in the public that still have nagging questions with your present plans

I am very impressed with the work done to date. It is outstanding. Best wishes for continued successes.

Faith F. Fort

To: Mr. Stephen McCracken
FAX: 1-636-447-0739

From:
Garth F. Fort
Telephone: Office (314) 674-8886
Home(314) 991-2967

Subj: Attachment
(Appendix to
Comments)

Garth

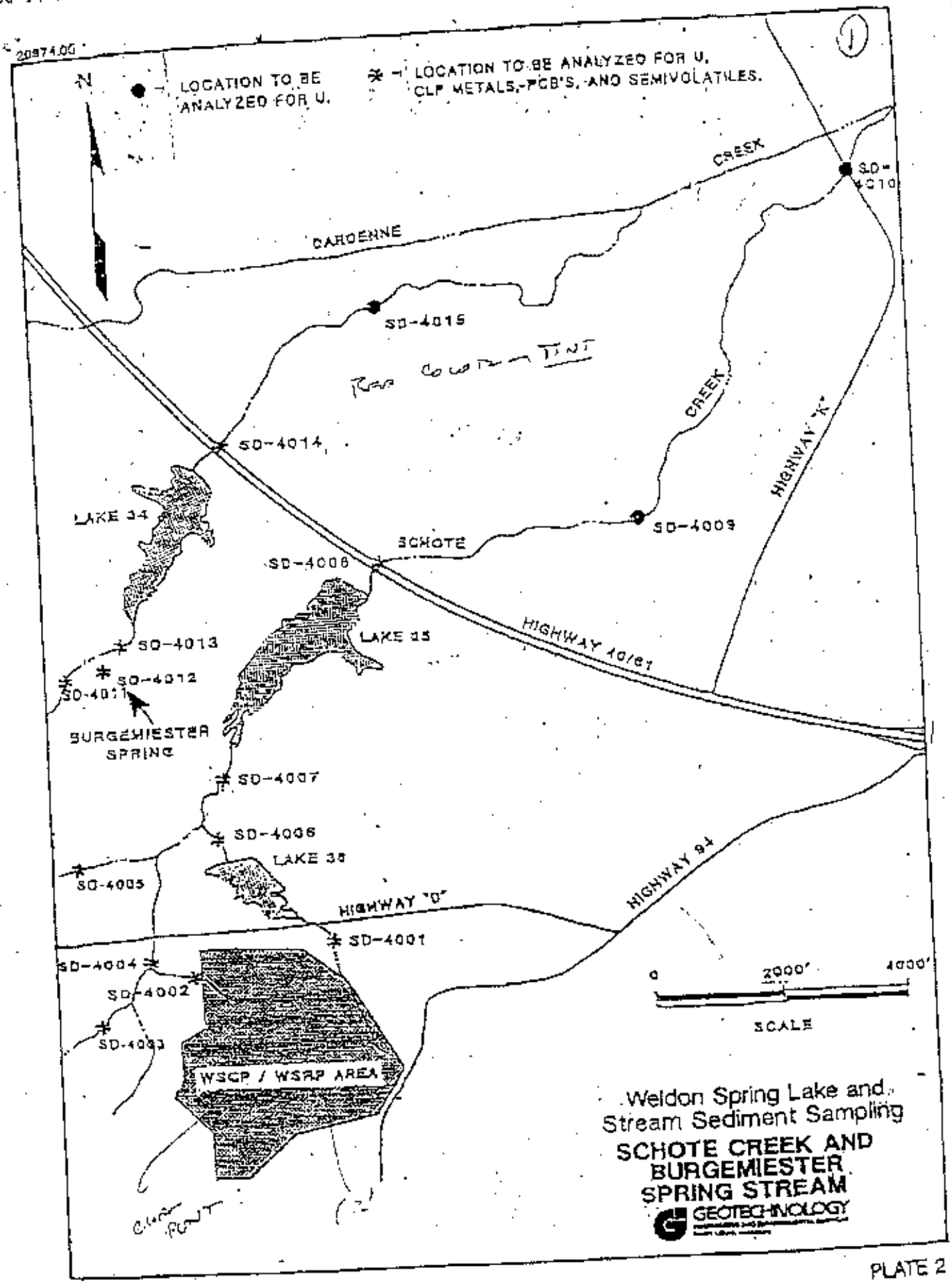
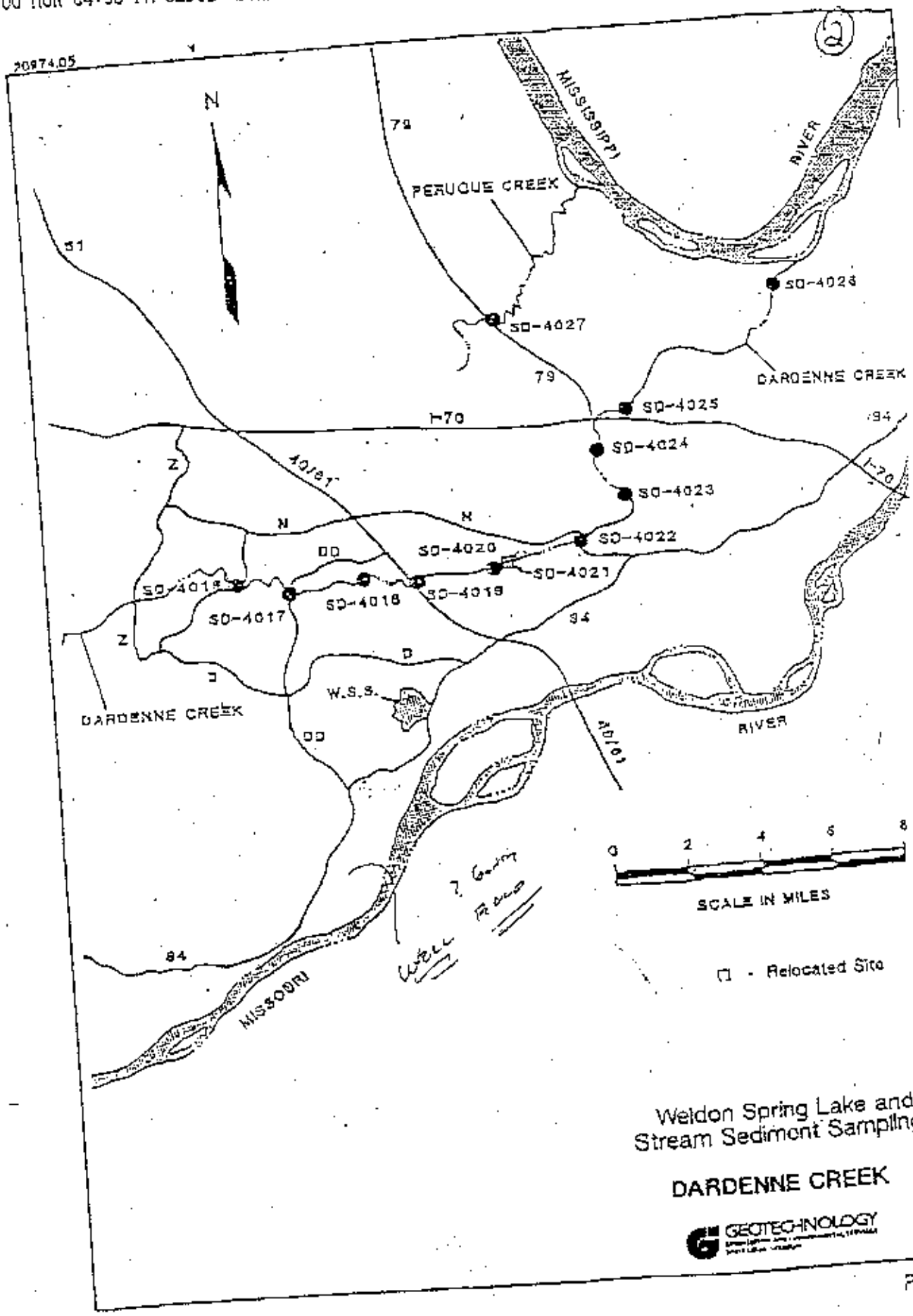

1
2097400
N
LOCATION TO BE ANALYZED FOR U.
LOCATION TO BE ANALYZED FOR U, CLP METALS, PCB'S, AND SEMIVOLATILES.
CREEK
SD-4010
CARDENNE
SD-4015
CREEK
HIGHWAY "K"
SD-4014
LAKE 34
SD-4009
SCHOTE
SD-4008
LAKE 35
HIGHWAY 40/61
SD-4013
SD-4012
SD-4011
BURGEMIESTER SPRING
SD-4007
SD-4006
LAKE 36
SD-4005
HIGHWAY 94
HIGHWAY "D"
SD-4001
SD-4004
SD-4002
SD-4003
WSCP / WSRP AREA
0
2000'
4000'
SCALE
Weldon Spring Lake and Stream Sediment Sampling
SCHOTE CREEK AND BURGEMIESTER SPRING STREAM
GEOTECHNOLOGY

PLATE 2



Weldon Spring Lake and Stream Sediment Sampling

DARDENNE CREEK

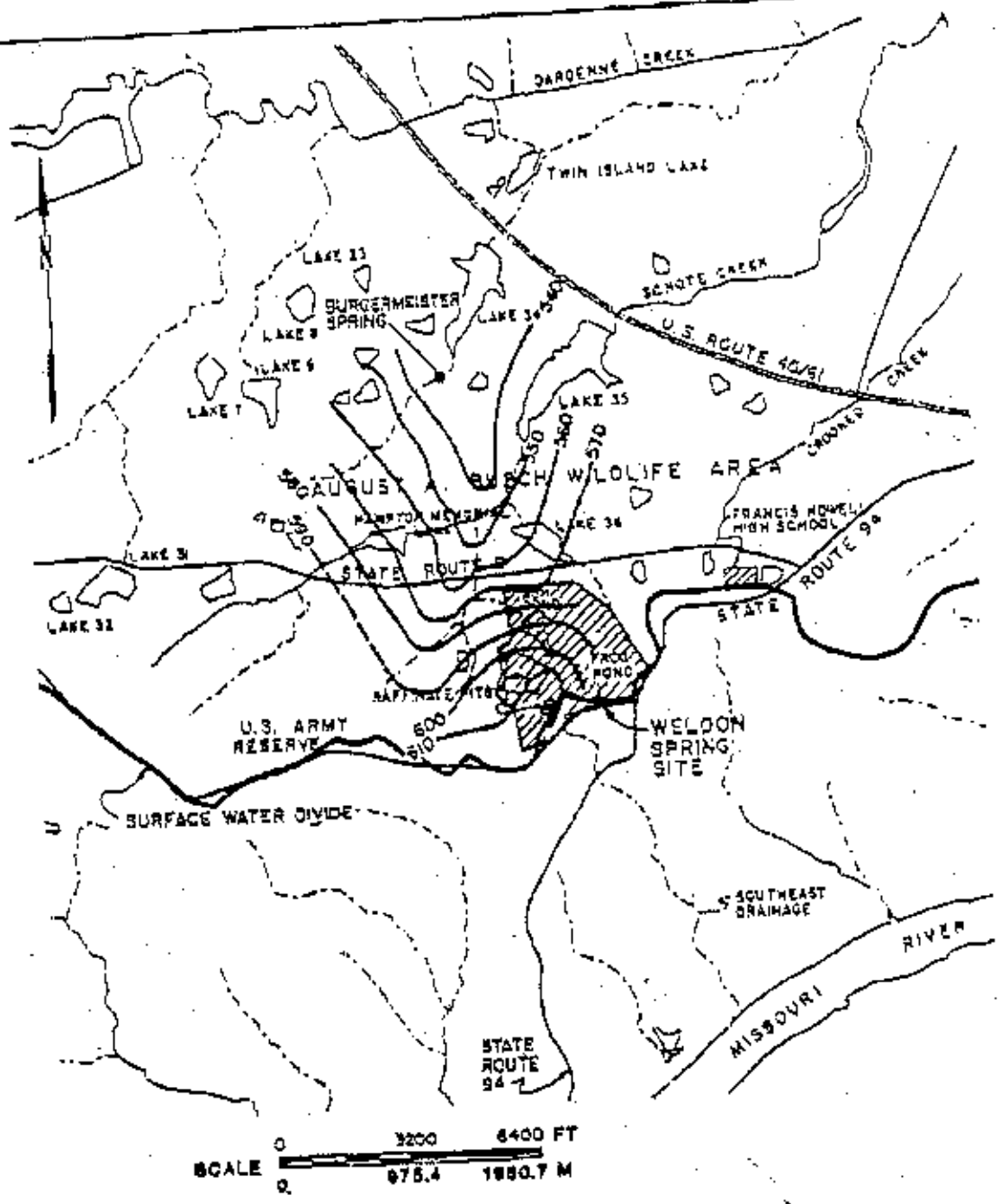
GEOTECHNOLOGY

PL

Radionuclide Concentrations in Dardenne Creek Sediment
(pCi/g)

Location	Uranium	Radium-226	Thorium-230	Thorium 232
SD-4009	1.5			
SD-4015	1.6			
SD-4016	ND	ND	ND	ND
SD-4017	ND			
SD-4018	ND			
SD-4019	ND	ND	ND	ND
SD-4020	ND			
SD-4021	ND			
SD-4022	ND	ND	ND	ND
SD-4023	1.1			
SD-4024	ND			
SD-4025	ND	1	1	1.1
SD-4026	1.9			

Detection Limit = 1 pCi/g

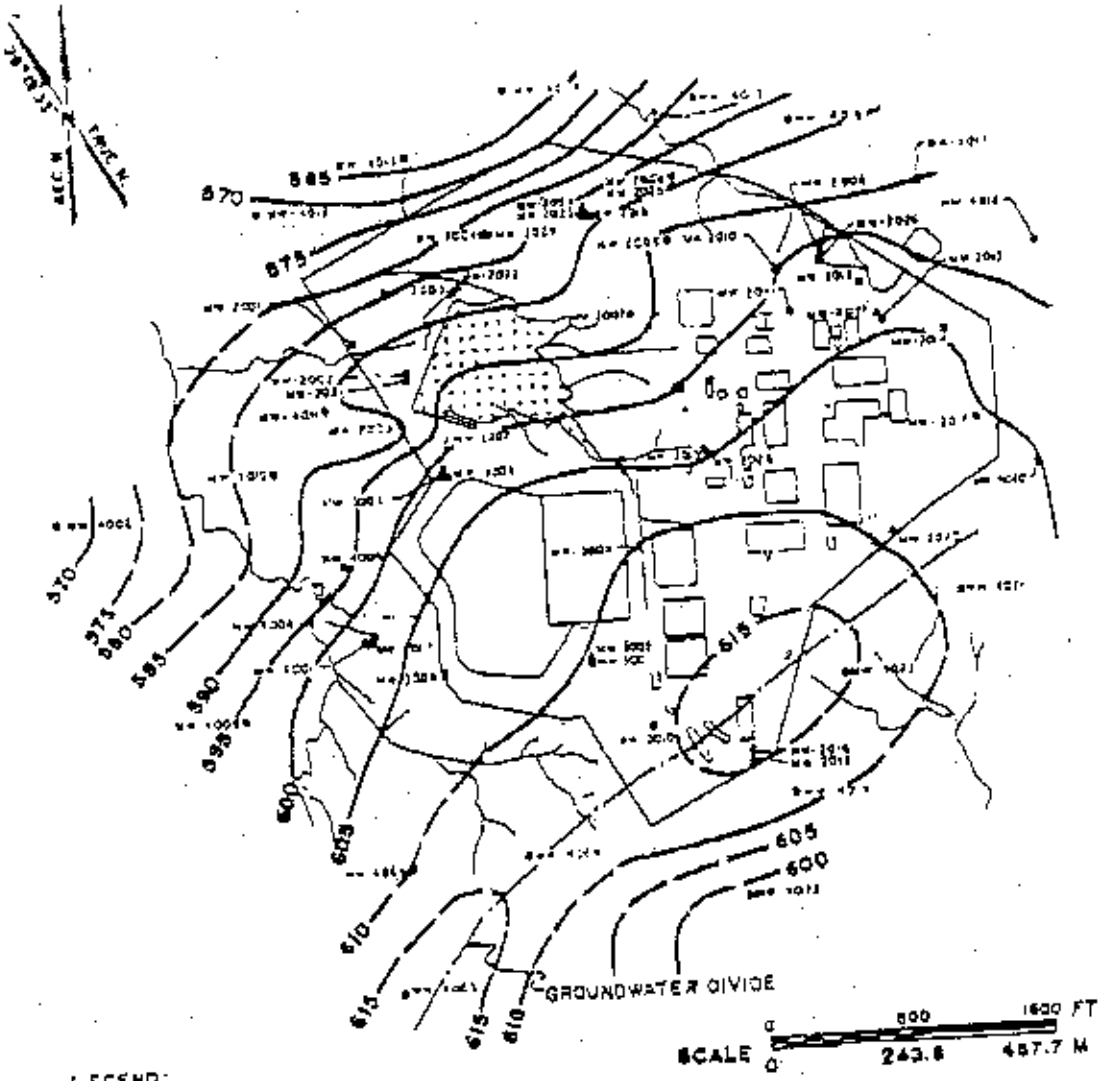


SOURCE: KLEESCHULTE & EMMETT 1987

POTENTIOMETRIC SURFACE, SHALLOW BEDROCK AQUIFER - WSS-VICINITY, JULY 1987

FIGURE 4.6-3

REPORT NO.: DOS/OR/21548-074		DOCUMENT NO.: A/VP/183/1191	
DESIGNATOR: BLG	DRAWN BY: GLN	DATE: 11/91	



LEGEND:

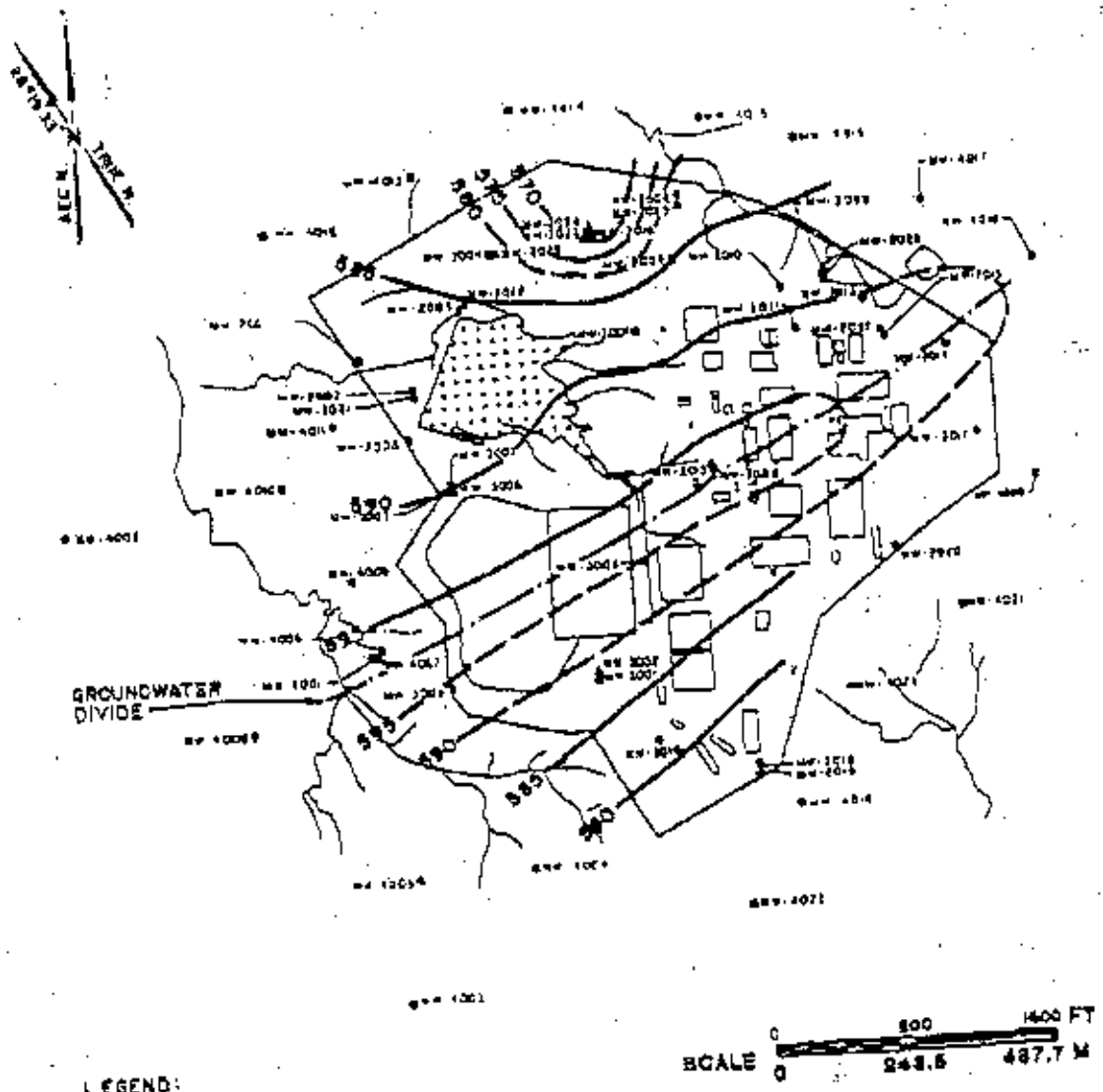
- SHALLOW MONITORING WELL
- DEEP MONITORING WELL
- —600— POTENTIOMETRIC CONTOUR (FT-MSL)

SOURCE: TABLE 4.6-8

POTENTIOMETRIC SURFACE, SHALLOW WELLS - JULY 1988

FIGURE 4.6-5

REPORT NO DOE/OR/21548-074		DRAWING NO A/CP/201/1191	
DESIGNATOR BLG	DRAWN BY GLN	DATE 11/91	



LEGEND:

- ● SHALLOW MONITORING WELL
- ▲ DEEP MONITORING WELL
- —595— POTENTIOMETRIC CONTOUR (FT - MSL)

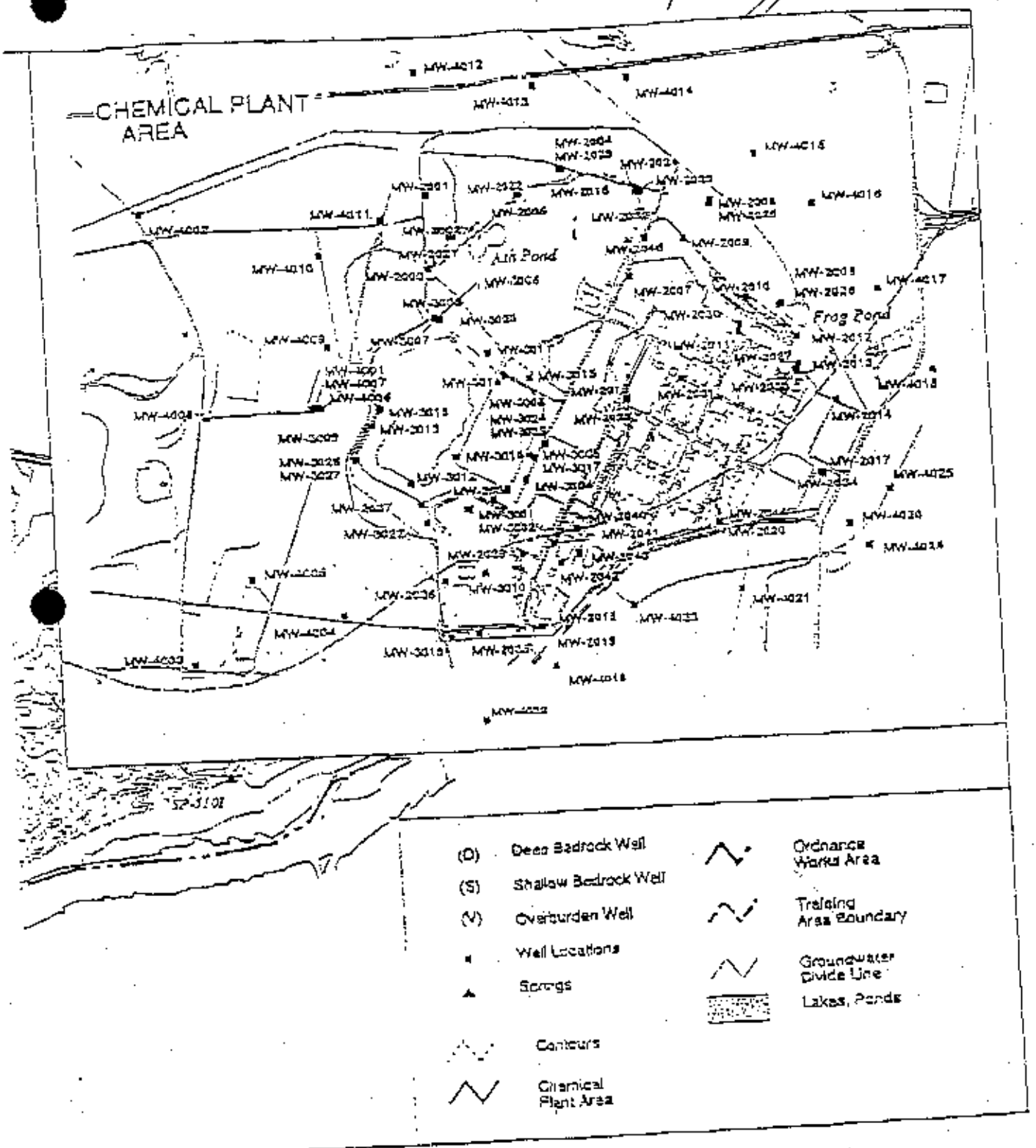
SOURCE: TABLE 4.6-8

POTENTIOMETRIC SURFACE, DEEP WELLS - JULY 1988

FIGURE 4.6-6

REPORT NO.	DOE/OR/21548-074	EXHIBIT NO.	A/CP/202/1191
PREPARED FOR	BLG	DRAWN BY	GLN
		DATE	11/91

Fig 2


CHEMICAL PLANT AREA
Ash Pond
Frog Pond
(D) Deep Bedrock Well
(S) Shallow Bedrock Well
(V) Overburden Well
Well Locations
Springs
Contours
Chemical Plant Area
Ordnance Works Area
Tailing Area Boundary
Groundwater Divide Line
Lakes, Ponds

Area

Page 1
Connects to Page 2 →

FIGURE 2.1 Location of Monitoring Wells and Springs at the Chemical Plant Area and the Ordnance Wo

→ St. Louis Did not comment.

C. Savage

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2ND DISTRICT, MISSOURI

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Congress of the United States
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Washington, DC 20515–2502

FACSIMILE

Congressman James Talent
555 North New Ballas Road
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(314) 872-9561
(314) 872-3728 FAX

From:

___ Pete Cooper	___ Kimberly McCllntock
___ Kerry DeGregorio	___ Tony Paraino
___ Rick Edlund	___ Sherman Parker
___ Tom Horgan	___ Mike Mills

To:

Please Deliver To: Steve McCracken

Date: 8/15/2000 **Fax Number:** _____

Pages Faxed (Including Cover Sheet): _____

Comments: Rep Talent's + Holshoff's comments re: groundwater remediation by DOE

Tom H

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August 14, 2000

Mr. Stephen McCracken
Project Manager
Weldon Spring Site
U.S. Department of Energy
7295 Highway 94 South
St. Charles, Missouri 63304

Dear Mr. McCracken:

We are writing to comment on the U.S. Department of Energy's proposal for the remediation of the Weldon Spring Site Remedial Action Project (WSSRAP). Specifically, we want to address the groundwater remediation of the remaining contaminants, which include trichloroethylene (TCE), uranium and nitrate

In terms of the TCE contamination, we encourage the Department of Energy (DOE) to proceed with its proposed remediation plan for this site. However, on the issue of uranium and nitrate contamination, we urge the DOE to work in close cooperation with MDNR to conduct the necessary studies to determine the feasibility of treating these contaminants. This should include the study of alternative technologies that might be able to achieve this result. In the mean time, we hope that DOE will institute a long term monitoring process with the appropriate institutional controls.

In closing, we would like to thank you for allowing me the opportunity to comment on this matter.

Sincerely,

Jim Talent
Member of Congress

Kenny Hulshof
Member of Congress

JT/th

C. Stringer

Missouri Coalition for the Environment

6267 Delmar Boulevard, Saint Louis, Missouri 63130 314/ 727-0600

FACSIMILE TRANSMITTAL SHEET

DATE: August 15, 2000.

TO: STEVE MCCRAKEN, PROJECT MANAGER

FROM: REBECCA M. WRIGHT

RE: WELDON SPRING SITE GROUNDWATER OPERABLE UNIT

CC:

PAGES TO FOLLOW: 3 pages Including cover

[CLICK HERE AND TYPE RETURN ADDRESS]

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AUG 15 2000

August 15, 2000

Mr. Steve McCracken
Project Manager
DOE Weldon Spring Site
7295 Highway 94 South
St. Charles, MO 63304

Comments on the Weldon Spring Site Groundwater Operable Unit

The Department of Energy (DOE) has spent considerable time and money cleaning up radioactively contaminated buildings and soil at the Weldon Spring Site. The material is "temporarily" confined in a bunker. It does not make sense that the DOE spend so much time and money cleaning up the solids only to leave the groundwater contaminants to make their way through the fractured limestone, which they are certain to do. Radioactive materials at the site were uncontrolled and in contact with the environment for more than 50 years in the 4 raffinate pits, the Ash Pond and Frog Pond, two other dump sites, and the Quarry. Uranium dust from the chemical plant settled over the site. Monitoring indicates that radioactive contaminants have already migrated into the groundwater and are present in the gaining and losing streams. Institutional controls will not stop the contaminated groundwater from migrating further. No land use or access restrictions, legal covenants, fences, warning signs, guards, and no amount of information on a shelf in a government office will stop contaminated water from percolating through the limestone into our drinking water.

The DOE has admitted that trichloroethylene is contaminating the groundwater and intends to clean it up. If the TCE is a problem, then certainly radioactive contamination has had the same opportunity to migrate and may well be a more persistent and extensive problem.

The DOE intends to rely on stewardship measures for as long as hazards persist, in the case of long-lived radionuclides, indefinitely. Because of the uncertainty of the long-term behavior of radioactive contaminants in the groundwater, health risks, the encroaching development in St. Charles County, and the likelihood that institutional management measures will fail at some point, contaminant reduction should be the preferred option.

The National Academy of Sciences recommends continued research and development of new technologies that can lessen dependence on fallible institutional arrangements necessitated by current technical limitations. Therefore I recommend that the DOE continue to monitor the groundwater, including reevaluation and improvements to the current monitoring system, and review pump-and-treat technologies and successful implementation elsewhere for applicable solutions to the groundwater treatment at the Weldon Spring site.

Thank you for the opportunity to comment.

Sincerely,

Rebecca M. Wright

Rebecca M. Wright, Board Member
Missouri Coalition for the Environment
2011 Ruiger St.
Saint Louis MO 63104

Bibliography:

National Research Council, National Academy of Sciences. Long-Term Institutional Management of U.S. Department of Energy Legacy Waste Sites. Prepublication Copy.

New York Times. "Nuclear Sites May Be Toxic In Perpetuity, Report Finds." August 8, 2000

U.S. Department of Energy, Office of Environmental Management. Status Report on Paths to Closure. March, 2000.

_____. From Cleanup to Stewardship. October 1999.

U.S. Department of Energy, Weldon Spring Site Remedial Action Project. Feasibility Study of Remedial Action for the Groundwater Operable Units at the Chemical Plant Area and the Ordnance Works Area At the Weldon Spring Site, Weldon Spring, Missouri. December 1998

Wall Street Journal. "Study of U.S. Nuclear-Waste Sites Calls DOE's Cleanup Approach Inadequate." August 8, 2000.

C Gidge

515 West Point Ave.
University City, MO 63130
August 15, 2000

Mr. Stephen McCracken, Project Manager
Weldon Spring Site Remedial Action Program
U.S. Department of Energy

Re: Groundwater Operable Unit

Dear Mr. McCracken:

In this, my third submittal of comments on the Weldon Spring Groundwater Operable Unit, I would again like to urge the Department of Energy to clean up the groundwater at Weldon Spring – or if not, at least to admit to the public that, while the surface features of the abandoned uranium plant site have been impressively dismantled, exhumed and piled up into a 45-acre, seven-story-high storage bunker, the underlying aquifers and associated springs and streams remain contaminated and should be avoided, both on- and off-site.

The citizens of St. Charles County have sacrificed their health, safety, lands and peace of mind long enough in the name of national security – extending back in time to 1940-41 when property owners of some 18,000 acres (surrounding the towns of Howell and Hamburg) were dispossessed by the federal government for the construction of what was to become the world's largest TNT munitions plant.

St. Charles Countians will be hosting a bunker with nuclear weapons wastes forever into the future – until, perhaps, it may one day collapse into its karst limestone bedrock. They should not have to worry when their children want to go hiking along Dardenne Creek, or explore near Burgermeister Spring or along the Southeast Tributary where it crosses the KATY trail. The groundwater rises and sinks at Weldon Spring where uranium and TNT were processed for weapons purposes. Groundwater will continue to be exposed to residual contaminants and will continue migrating within and off the site. St. Charles County residents, and those of us who live downstream from them, have a right to expect that the federal government will act responsibly and will complete the cleanup of the Weldon Spring Site.

Some of the materials at Weldon Spring will continue giving off radioactive particles and rays for many, many years. Scientists have claimed for decades to know precisely the half-life of every radioactive isotope discovered thus far. They have told us that the primary radioactive contaminants of concern at Weldon Spring, for example, have the following half lives: thorium-232 = 14.1 billion years; uranium-238 = 4.51 billion years; thorium-230 = 80,000 years; and radium-226 = 1600 years.

The above half-lives have been listed in The Chemical Rubber Company's Handbook of Chemistry and Physics since at least the 54th edition (1973-74). Brookhaven National Laboratory, however, in its July 1990 edition of the "Nuclear Wallet Cards," claims that the half-life of thorium-230 is "only" 75,380 years. This difference from the CRC Handbook may seem insignificant – especially remembering that one has to multiply by at least ten the half-life of an isotope to estimate its hazardous life. But what seems significant to me is the fact that scientists keep learning new things about the radiochemistry and radiotoxicity of the isotopes. They apparently don't really know precisely the longevity of the Weldon Spring poisons. In addition,

they also seem to keep discovering surprise toxins there. Only in 1996, for example, did anyone look for – and find – trichloroethylene (TCE), the chemical just recently dubbed Weldon Spring's "predominant potential risk driver." (from the DOE's Proposed Plan for Remedial Action for the Groundwater .... Weldon Spring Site, July 1999, p. 43) According to the 1998 Weldon Spring Environmental Report for 1998, the source of the TCE and other volatile organic solvents "remained unknown." (p. 142)

A lot is known about the contaminants above and below the ground at Weldon Spring, and a lot remains unknown. The DOE's proposed plan to walk away from all the contaminants in the Weldon Spring groundwater (except for the TCE which is present only in Zones 1 and 2, near the raffinate pits area) would constitute a permanent decision. Once the DOE and its contractors pack up their billion-dollar project and head off to contaminated sites elsewhere, nothing short of the collapse of the disposal cell could ever get them back! Evidence accumulated from years of monitoring-well sample analyses – evidence even from those wells that may have been defectively designed or installed – makes it clear that the groundwater at the Weldon Spring Site and its vicinity properties is radioactively and toxically contaminated. Why were all the costly groundwater tests taken for so many years if the results were to be ignored? Costly, indeed, both financially and in terms of worker exposure.

Many questions remain, including:

1. To what extent can we trust the monitoring well data? Why were wells only tapped into the shallow aquifer and not into the middle and deeper aquifers — the aquifers used for most of the private and municipal drinking water wells?

Recognizing the non-controvertible fact that the Weldon Spring Site is located in a karst terrain – with losing streams, sinkholes, springs and solution cavities – how could it possibly have been determined that the contaminants that have leached or were dumped into the environment for decades would remain confined in only the upper, shallow aquifer? To quote from the U.S. Geological Survey Open File Report 93-648, "Geohydrology, Water Quality, and Simulation of Ground-Water Flow at the Weldon Spring Chemical Plant and Vicinity, St. Charles County, MO, 1987-90," by M.J. Kleeschulte and J.L. Imes, February 1994:

> "A three-dimensional ground-water flow model was developed to qualitatively assess the flow between aquifers at the chemical plant site and to address the potential for contaminated water to enter the deep aquifer from directly under the chemical plant. . . . The conclusions based on the steady-state model simulation using the pumping scenario indicate 21 percent of the flow in layer 1 [the shallow aquifer] infiltrates into layer 2 [the middleaquifer] in a nine model cell area centered at the chemical plant site. Approximately 80 percent of the flow going out of layer 2 infiltrates into layer 3 [the deep aquifer] in this same area." (p. 98)

The number of groundwater monitoring wells installed in the shallow aquifer beneath the Weldon Spring Site over the years has been impressive, though also worrisome in that some of the wells may have exacerbated the condition underground of natural fractures, conduits and other pathways already present throughout the karst limestone. It has seemed to me that often when elevated levels of radioactive or hazardous contaminants have been found in a monitoring well sample, the value has been discounted as being merely an anomaly. For example: "An

above-background thorium [thorium-230] level was recorded at Monitoring Well-2044. [The map seems to place this well near the DOE's Administration Building or the Frog Pond, perhaps]. This value is thought to be a measurement error." (from the Weldon Spring Environmental Report – 1994; pages 128-129).

To quote from the Illinois State Geological Survey report, "Groundwater Contamination in Karst Terrain of Southwestern Illinois," by S.V. Panno, et al.; 1996:

> "Groundwater in karst regions is very susceptible to contamination because the fractured and honeycombed nature of karstified carbonate rock commonly provides a direct connection between surface water and groundwater. Recharge to the water table in these regions is often nearly instantaneous, and the infiltrating water does not have the benefit of the slow filtration through fine-grained materials that allows for chemical, biological, and physical degradation and attenuation of potential contaminants." (p.3 – quoting from books by W.B. White and by D.C. Ford and P.W. Williams)

2. How extensively have the soils been tested throughout the 200-acre Chemical Plant Site?

The method for reducing the workers' potential exposure to respirable concentrations of contaminants in the Weldon Spring uranium/thorium processing buildings was to discharge the radioactive dusts to the atmosphere, using a primitive bag filter in the vents. Much was caught that way, but an undeterminable amount was also released, often settling nearby on the soil and into the streams. Some of those materials have long since washed or blown offsite, some have leached into the aquifers, and some probably remain in dispersed areas at or near the ground level, on site.

Liquid wastes from the industrial processes were discharged into the outfall sewer (now called the Southeast Drainage) and elsewhere on site. While much of the liquid waste from the outfall sewer has already ended up in the Missouri River, some no doubt sank into the losing stretches of the SE Drainage, and of other outfall lines where wastes were also dumped. Added to the above dispersion of wastes were the wet, highly-radioactive sludges that were dumped into the 26 acres of raffinate pits. The quantity of long-lived contaminants that potentially could have migrated into the groundwater at the Weldon Spring Site – into the karst terrain -- in the past half-century is indeed significant. The mass that remains in the underground maze today is unknown and, most probably, unknowable.

3. What are the true health risks of leaving the groundwater untreated – both the radiological and non-radiological risks?

Quoting from the "Public Health Assessment for the Weldon Spring Quarry/Plant/Pits (USDOE)," CERCLIS No. MO3210090004, June 30, 1997, published by the US Public Health Service's Agency for Toxic Substances and Disease Registry:

> "Incidence data on childhood leukemia in St. Charles County for 1970-1993 indicate two time periods with statistically greater numbers of cases than expected. . . . the geographic distribution of those cases did not appear to have any relation to the chemical plant site. . . . The Missouri Department of Health plans to follow up on these results, <u>if funding becomes available</u>, by conducting a case-control study of childhood leukemia in

St. Charles County, including a detailed evaluation of the geographic distribution of the documented leukemia cases." (pp. 30-31, emphasis added)

Many of us who have been concerned about the Weldon Spring Site for many years continue to have questions about the health risks of this site, including its groundwater.

Even when state-of-the-art well sample collection and analysis technologies have been used and sophisticated computer modeling techniques, the mass, fate and transport of the existing and future Weldon Spring Site groundwater contaminants can be neither precisely assessed nor predicted. Starting in 1983, or perhaps earlier, incredible numbers of groundwater wells have been installed and samples collected by government agencies and commercial contractors. Because the Army's Atlas Powder explosives plant and the Atomic Energy Commission's Mallinckrodt uranium feed materials plant operated in a karst limestone terrain, a definitive analysis of the commingled contaminants is not possible. Everyone concurs that contamination from this federal site has migrated into the underground world within and beyond the site – through preferred pathways, such as fractures and solution-enlarged conduits in the bedrock. The controversy centers on the amounts, locations, directions and velocity of the groundwater flow – and about the hazards.

I hope the DOE and the EPA will reconsider their conclusion that the groundwater contaminants cannot and need not be cleaned up. Those of us who live downstream of this underground polluted resource and who rely on wells or on the Missouri and Mississippi rivers are entitled to the best possible drinking water, purified and protected by the best available technologies.

Or if, after thorough testing of pump and treat technologies, and others, the DOE decides the groundwater cannot be cleaned up, I hope the DOE will at least level with the public by announcing that a comprehensive cleanup is not possible and will then employ the best available technologies to try to isolate the site, the affected vicinity properties, and the contaminated nearby fishing lakes (and the Femme Osage Slough!) for as long into the future as possible.

In conclusion, I would like to quote from the report just published by the National Research Council, of the National Academy of Sciences – entitled "Long-Term Institutional Management of US Department of Energy Legacy Waste Sites":

> "Of the sites in DOE's inventory, few will be cleaned up sufficiently to allow unrestricted use. At many sites, radiological and non-radiological hazardous wastes will remain, posing risk to humans and the environment for tens or even hundreds of thousands of years. In some cases, contaminants have migrated off-site or are likely to do so in the future. . . . **Scientific, technical, and organizational deficiencies or knowledge gaps should be acknowledged frankly and, where possible, research investments should be made to correct them.**"

Sincerely,

Kay

Kay Drey

August 14, 2000

Mr. Stephen McCracken, Project Manager
Weldon Spring Site - Department of Energy
7295 Highway 94 South
St. Charles, Mo. 63304
Fax 1-636-447-0739

Re: Clean up of Weldon Spring Radioactive Groundwater

Dear Mr.McCracken:

I am writing as a concerned citizen, requesting that clean-up efforts at Weldon Spring include clean-up of the groundwater to safe drinking water standards.

It is my understanding that DOE is proposing to only treat the groundwater for trichloroethylene (TCE) with no guarantee that this will be continued until acceptable standards are reached. Also, DOE proposed NO treatment for the radioactive contamination (uranium) or the explosives waste in the aquifer. I understand that technologies are available that can remove much of the radioactive and hazardous waste from the groundwater. I consider it essential that these current technologies be applied to eliminate the hazards at this site.

Sincerely,

Richard Dreyer

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AUG 16 20

Mr. Richard A. Dreyer
P.O. Box 6933
Saint Louis, MO 63123-0233

Mr. Stephen McCracken - Project Mgr.
Weldon Spring Site - Dept. of Energy
7295 Hwy 94 South
St. Charles, MO
63304

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TO: Stephen McCracken, Project Manager
Weldon Spring Site - US Department of Energy
7295 Highway 94 South
St. Charles, MO 63304

FROM: G. Clare Laune
16651 Caulks Creek Ridge
Chesterfield, MO 63005

cc: Governor Mel Carnahan
Ms. Mimi Garstang
Mr. Dennis Grams
Mayor Clarence Harmon
Mr. Stephen Mahfood
County Exec., Buzz Westfall

DATE: August 15, 2000

RE: Weldon Spring Groundwater

Thank you to the US Department of Energy for extending the comment period re the Weldon Spring Groundwater, and thank you to the St. Louis City Board of Alderman and the St. Louis County Council for passing resolutions requesting the extension on this most important issue. Following are my comments.

For the health and well-being of our area communities I urge the US Department of Energy to include clean-up of the radioactive and explosives wastes in the groundwater remediation efforts at Weldon Spring. It is essential that current and promising technologies be tested and applied to remove the radioactive and hazardous wastes and to remediate the groundwater to safe drinking water standards.

Because of the nature of the limestone karst at Weldon Spring, every effort must be made to prevent any migration of contaminants in order to protect the underlying aquifers. This effort must be made to protect the water intakes of communities in and around the area and those downstream along the Mississippi and Missouri rivers. Food supplies from local gardens and farmlands must be safeguarded and the economic viability of this region, which is reliant on healthy water sources, must be preserved.

I urge the EPA to establish an Independent Review Panel to re-consider the DOE/EPA decision not to remediate the radioactive and explosives wastes in the groundwater. We need this panel to represent all voices. I also request that the Department of Natural Resources be given full partnership in monitoring efforts and all processes related to this issue. I believe this would provide a vehicle for communication of concerns among federal, state and local areas.

Additionally, I request that the most advanced, effective, accurate monitoring systems for testing radioactivity in the groundwater be installed on site. I understand there is some concern about the accuracy of readings from some of the older wells, due to their design and inplacement. PLEASE REPLACE THEM WITH CURRENT, EFFECTIVE MONITORING SYSTEMS, so that we can be assured effective systems are in place to protect those working on site, and the communities at large, now and in the future.

Please keep the public informed as follows: 1) clearly mark areas which have not yet been remediated to deny public access; 2) inform the public of clean-up progress via public forums and/or press conferences, preferably in conjunction with the MO Department of Natural Resources.

In conclusion, thank you again for providing this comment period, and for all the clean-up work already accomplished. Thank you for taking my concerns seriously. The health and well-being of our communities are entrusted to your care in this matter.

G. Clare Laune

G. Clare Laune

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16651 Caulks Creek Ridge
Chesterfield MO 63005

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Mr. Stephen McCracken, Project Manager
WELDON SPRING SITE - US DEPARTMENT OF ENERGY
7295 Highway 94 South
St. Charles MO 63304

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.U ST 15, 2000

EPARTMENT OF ENERGY
Ir. Stephen McCraken, Project Manager
Veldon Springs Site - DOE
295 Highway 94 South
t. Charles, MO 63304

ear Mr. McCraken:

s a part of the St. Louis Community I am requesting that the CLEANUP EFFORTS AT WELDON PRINGS INCLUDE CLEANUP OF THE GROUNDWATER TO SAFE DRINKING WATER TANDARDS.

e power to do this rests in your hands. Please see fit to help make our world a safer place to live. WE RE COUNTING ON YOU TO DO WHAT WE CANNOT DO ON OUR OWN.

ank you,

ebecca Wiederkehr

Rebecca Wiederkehr

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AUG 16 2000

Rebecca Wiederkehr
1514 Robin Hood Ct
Saint Louis MO 63122-5040

ST. LOUIS MO
PM
2000

Mr. Stephen McCracken
Project Manager
Weldon Spring Site - DOE
7295 Highway 94 South
St Charles, MO. 63304

63304-2203

To: Stephen McCracken, Project Manager, Weldon Spring Site

Re: Weldon Spring Site groundwater

The DOE's proposal to leave radioactively contaminated groundwater at Weldon Spring poses an unacceptable health risk to the people of St. Charles County, St. Louis County and the City of St. Louis.

Government policy should be guided by the physician's rule, "First, do no harm." This rule is embodied in the precautionary principle, which tells us that whenever reasonable scientific evidence exists indicating that a given activity might be harmful, we should act to prevent harm. The precautionary principle was introduced in Europe in the 1980's and became the basis for the 1987 treaty that bans dumping of persistent toxic substances in the North Sea. Countries like Germany and Sweden have passed environmental laws based on the precautionary principle - and as a consequence have developed newer, cleaner technologies. The precautionary principle has been discussed and promoted at various international conferences on toxic wastes and ozone depletion.

A comprehensive definition of the precautionary principle was spelled out in a January 1998 meeting of scientists, environmentalist and policy makers at Wingspread, headquarters of the Johnson Foundation. It states in part:

"We believe existing environmental regulation and other decisions, particularly those based on risk assessment, have failed to protect adequately human health and the environment...

..Therefore, it is necessary to implement the Precautionary Principle: When an activity raises threats of harm to human health or the environment, precautionary measures should be taken even if some cause and effect relationships are not fully established scientifically.

..The process of applying the Precautionary Principle must..involve an examination of the full range of alternatives, including no action."

The DOE's proposel violates this principle in two ways: It has not demonstrated (1.) that leaving the groundwater where it is is safe, or (2.) that no better alternatives are available.

DOE critics claim that technologies are available that can remove much of the radioactive and hazardous waste from the groundwater. Whether or not these technologies are "cost-effective", the public interest demands that they be tested to reduce the hazards at the site.

Louise Green

Louise Green

11 Litzsinger Lane

St. Louis, MO 63124

024660

Louise Green
11 Litzsinger Lane
St. Louis, MO 63124

33USA

Mr. Stephen McCracken, Project Manager
Weldon Spring Site
DOE, 7295 Hway 94 South
St. Charles, MO 63304

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\UGUST 15, 2000

)EPARTMENT OF ENERGY
/r. Stephen McCraken, Project Manager
Veldon Springs Site - DOE
295 Highway 94 South
;t. Charles, MO 63304

)ear Mr. McCraken:

am requesting that the CLEANUP EFFORTS AT WELDON SPRINGS INCLUDE CLEANUP OF THE
;ROUNDWATER TO SAFE DRINKING WATER STANDARDS.

'ou[illegible]fluence in this matter is greatly needed. Please do not let us down.

hanks.

incerely,

ee Potts

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AUG 16 2000

Lee Potts
1514 Robinhood Court
St. Louis, MO 63122-5549

Mr. Stephen McCraken
Project Manager
Weldon Spring Site-DOE
7295 Highway 94 South
St. Charles, MO 63304

August 15, 2000

Mr. Stephen McCracken
Project Manager
Weldon Spring Site – DOE
7295 Highway 94 South
St. Charles, MO 63304

Dear Mr. McCracken:

I understand that the DOE is planning to treat groundwater at the Weldon Spring site for trichloroethylene only, and that with no guarantee that the treatment used will achieve permissible levels for this contaminant. Furthermore, DOE plans no treatment for the radioactive contaminant uranium or for the explosive wastes in the groundwater.

I demand that DOE properly clean the groundwater at the Weldon Spring site until A contaminants are removed and the groundwater is certified to meet safe drinking water standards for any and all substances tested for in these standards.

Sincerely,

Claire L. Schosser

Claire L. Schosser
5304 Fletcher Ave.
St. Louis, MO 63136

024656

300

Claire Schoessler
5304 Fletcher Ave.
St. Louis, MO 63136

PM
2000

Mr. Stephen McCracken
Project Manager
Weldon Spring Site - DOE
7295 Highway 94 South
St. Charles, MO 63304

63304+2203

6306 Southwood Avenue 3W
St. Louis, Missouri, 63105

George Boniface

Voice: 314-726-0661
Email: frankelface@eathlink.net

8/15/00

Mr. Steven McCracken
Project Manager
Weldon Spring Site – D.O.E.
7285 Highway 94 South
St. Charles, Missouri, 63304

Dear Mr. McCracken,

I recently heard you on KDHX radio in St. Louis to explain the cleanup of the Weldon Spring hazardous-waste site. Your voice and what you said were very comforting. You seem to be a knowledgeable and fair-minded person. From what I gather the cleanup so far has been a good effort. However the job is not done. Because of the extremely hazardous nature of the radioactive materials at Weldon Spring combined with the fact they will remain highly toxic for billions of years, the absolute best possible cleanup effort is just barely good enough. Your confidence and laid-back tone glosses over very troubling issues. Problems not adequately dealt with are sure to resurface again and again, like groundwater in karst terrain.

For thousands of years the area St. Louis is built on has been a desirable place to live. The great Cahokia Mounds are evidence of a large nation that prospered long ago for many of the same reasons St. Louis is here today. There is good reason to believe that long after we are gone, future civilizations will come to the same conclusions we have and settle here. How water interacts with the land is the central factor. Water carved great river highways making St. Louis a natural transportation hub. This hub is vital to many areas far beyond the borders of the St. Louis region. Water also carved great caverns and endless networks of passageways through the limestone St. Louis built on. Water that has been so vital to this area will keep carving but its vitality is threatened.

The government knew of the hazards associated with toxic waste and karst terrain of before it started its nuclear program at Weldon Springs. They paid little heed to the 1951 report by Claude M. Roberts of the United States Department of Interior, Geological Survey titled "Preliminary Investigation of Groundwater Occurrences in the Weldon Springs Area St. Charles, Missouri". Granted things were different then. Completely irresponsible dumping occurred and was methodically ignored for decades. Cold war priorities do not exist anymore. We have grown wiser. You have spent some time cleaning things up. And you know that thorium -230 and uranium -238 are in the groundwater and spreading. Presently these contaminants are showing up in Burgermeister Spring and in Busch Wildlife Preserve lakes 35 and 36 (U.S.G.S. Water - Resources Investigations Report 85-4272). Where next? St. Louis City and County water intakes are directly down stream from the site, as are St. Charles' well fields. In addition current trends in population growth indicate that there will be increased demand for water in the aquifer.

Thorium-230 and uranium-238 are heavy metals. Heavy metals can bio-accumulate, that means they become more concentrated as they get passed up the food chain. Humans are at the top of the food chain. We stand to get the largest dose. Both thorium-230 and uranium -238 emit alpha particles. Their half-lives are 75 thousand years and 4.5 billion years respectively. Alpha particles are difficult to detect. Something as insubstantial as paper may impede their path, thus they are likely to evade attempts at monitoring. However alpha particles are highly radio-toxic when they

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AUG 16 2000

are inhaled or ingested. A little alpha particle goes a long way. When you multiply thorium-230 and Uranium-238's half lives by ten it is clear that time is not on our side.

The task of detecting contamination is compounded by the "narrow lateral channels" in the karst. The U.S. Geological Survey's Water – Resources Investigations Report 87-4169 clearly states "it is difficult to obtain water samples representative of drainage from the chemical plant area from randomly located monitoring wells." Has anyone looked at the possibility that the chemical soup that was dumped on the limestone karst might accelerate its erosion, carving new and unanticipated pathways? Could there be an undetected load of sludge meandering through the limestone on its way to opening new channels to our fresh water supply?

The D.O.E.'s history with nuclear material is full of unpleasant surprises. What surprises lay hidden at Weldon Spring? The Hanford Washington site recently had a nice one concerning plutonium dioxide. Plutonium dioxide is plutonium's form of rust. It was thought to be the most stable form of plutonium for long-term storage. There is no safe level of exposure to this material. This material is passing through the vadose zone a bit faster than anticipated, instead of the predicted 10,000 years of containment; it has reached ground water that feeds into the Columbia River in less than 50 years. Oops! The old theories suggest this material might be piggybacking on a colloidal material or clay and hitching a ride down stream. New evidence demonstrates that plutonium dioxide is water-soluble and is easily washed way. (Nuclear Waste, Understanding of waste migration at Hanford is inadequate for key decisions. The United States General Accounting Office, March 1998, GAO/RC be-98-80.)

Disregard and neglect created many of the problems you are dealing with and made them worse. Further inaction is sure to continue the trend. The prudent plan of action is to do all that can be done to contain this menace. So far you have done a pretty good job. You have spent nearly a billion dollars, it is less than 2.5 cents a year for the toxic life of this stuff. Now that is a cost almost too cheap to meter.

Keep up the good work. Don't stop now. The prudent plan of action is to rigorously explore ways to deal with the groundwater problem. Simply monitoring on an occasional basis is folly. Lack of detection does not mean that dangerous materials are not present. When uranium and thorium and their offspring show up in our drinking water or in the food chain it is too late. Time is against us.

Sincerely,

George Boniface

George Bonifacio
6206 Southwood SW
St. Louis, MO. 63105

Mr Steven McCracken
Project Manager
Weldon Spring Site - D.O.E.
7285 Highway 95 South
St. Charles, MO. 63304

63304/9999

2318 Half Moon
St. Louis MO 63114
August 10, 2000

Mr. Stephen McCracken
Project Manager
Weldon Spring Site - DOE
7295 Highway 94 South
St Charles MO 63304

Dear Mr. McCracken:

The Department of Energy must not leave the Weldon Spring Superfund site without cleaning up the groundwater under the site.

The groundwater must be brought up to permissible standards not only for trichloroethylene, but also for the radioactive uranium contamination and the explosive waste.

The D.O.E. must clean up all sources of contamination in the groundwater until drinking water standards are met.

Since technologies are available that can remove much of the radioactive and hazardous waste from the groundwater. It is essential that current and promising technologies be tested and applied to reduce the hazards at this site.

024655

I request that clean-up efforts at Weldon Spring include clean-up of the groundwater to safe drinking standards because the water we all drink is in jeopardy.

Yours truly,

Mary Louise Porcelli

2378 Half Moon
St. Louis MO 63114

ST. LOUIS MO
PM
15 AUG
2000

MR STEPHEN McCRACKEN
PROJECT MANAGER
WELDON SPRING SITE - DOE
7295 HIGHWAY 94 SOUTH
ST CHARLES MO 63304

63304+2203

9

Dear Mr. McCracken and Mr. Grams:

It's hard to say in words how upset I am at the thought that the Department of Energy & the Environmental Protection Agency Region VII may not choose to clean up the radioactively contaminated Karst groundwater of the Weldon Springs Site. See the enclosures on Karst and Karst groundwater for information on the importance that you do – two articles from the Missouri Conservationist of March of this year #1 "Below Missouri Karst" by William Elliott & 2. "Karst Groundwater: our Unique Water Recharge System Brings Pollution Perils" by Tom Aley.

I took hours to make a special collage I want included as a part of my comments. It speaks for itself – just as the enclosures do. I've titled the collage "Weldon Springs: A Prayer for our children, a prayer for the earth." Please do not shut down your cleanup program without cleaning up the radioactively contaminated groundwater – clean up the radioactive contaminants in the ground water. The drinking water for the entire St. Louis Metropolitan area is in jeopardy if you don't, as the aquifer underlying Weldon flows directly into the sole source of our water supply and the radioactive contaminants will in essence contaminate forever.

I came and visited the Weldon Spring Site Remedial Action Project on Friday, August 11, 2000 and was deeply distressed by remarks and answers given to many of my questions by Steven Warren, Rebecca Cato & Tom Pauling. Your people went way overboard to convince us visitors that everything was super safe at Weldon Springs, we needed no cleanup of the radioactively contaminated groundwater, and we could all sleep well at night. I am not sleeping well at night and here is why:

Point 1 I know you don't really know what is really in the groundwater. You have only dug wells a questionable 100ft into the shallow aquifer, not the source of our drinking water but all of which flows into the deeper aquifers. These wells are questionable in their effectiveness due to the possible dilution from the variable screen lengths. You've discovered radioactive contaminant levels higher than permissable standards. Radioactive wastes above and even below permissable standards causes cancers and other horrible diseases and forms of death. To top everything, you only tested for recreational levels of contaminants at best. Do you think the humans and creatures living in the areas affected by the groundwater the entire St. Louis & St. Charles area – are going to be using their drinking water recreationally?

Point 2 I find it sickening you are actually encouraging part of the Katy Trail being brought right up to the site to show off this site. With such overkill, including having humans walk on top the disposal cell as part of tours and Mr. Warren's callous comments about there being many things the government's (my money) could be spent on rather than groundwater clean up and that we'd already spent too much in his opinion. I question the DOE's ability to be unbiased enough to make the final decision about groundwater cleanup. I'm especially concerned about the way the DOE keeps hiding behind it being impractical and the DOE's denial of the health hazards the radioactive contaminants pose to humans when your own wells discovered higher than permissable standard. What are your standards for? Are you only going to act in the most gross cases of violations? Many lives are at stake.

Point 3 The DOE has been caught in denial before when it denied the clay under the raffinate pits were leaking. Thanks to a US Geological Survey, you were forced to admit they were. We can't afford the DOE's denial on the Groundwater radioactive contamination above permissable levels and the need to clean it up. It is not okay to walk away. You will be setting a dangerous precedent for cleanup in Missouri.

Point 4 After years of contaminating this site, laws mysteriously being changed so you could build a hazardous landfill on the site of Karst topography/terrain, and numerous PR copies you now don't want to clean up the Karst groundwater which you know full well is very special in nature or it wouldn't have been protected in the first place from landfills like yours which should never have been allowed. That disposal cell is no protection – it's only good for 200 years at the most – barring natural interference. The least you could do is clean up the groundwater, admit the whole site is dangerous and needs continuous, frequent ongoing monitoring, and development of technologies to eventual neutralize the radioactive contaminants.

Point 5 I concur with the National Research Council that your methods are inadequate and this site will remain dangerous for centuries. You must find adequate methods and the MDNR needs to be given more power in the process.

Point 6 Not only do I concur with James Williams that the radioactively contaminated groundwater can and must be cleansed of these contaminants, but the MDNR's final word is what should have authority – our state knows more about Karst and our interests and needs and needs more rights in this process.

Point 7 I want no more excuses. You have the money, you can develop the technologies you can set a humane precedent and stand by your standards, and you can admit this area is a health hazard. There is a significant connection between the shallow & deep aquifers. Please find a way to clean it up. Don't risk our children & our lives. This is a sole source aquifer as it flows directly into the sole sources of our drinking water. We made a mistake developing nuclear power & nuclear weapons. We can admit that and face this devastating legacy and at least make up for our mistakes honestly, with a recognition of the tragic health hazards posed and the priority need to do everything in our power to at least clean it up right & stop any more of its production.

Thank you
Chris McClarren

I would like a personal response
Chris McClarren
3936 Fillmore
St. Louis MO 63116

Enclosures #1 & #2

Enclosure #1

Over eons, the movement of groundwater has sculpted a labryinth of underground passages—both beautiful and awe inspiring. Missouri is rich in caves and has become known as the cave state.

Karst

by William R. Elliott

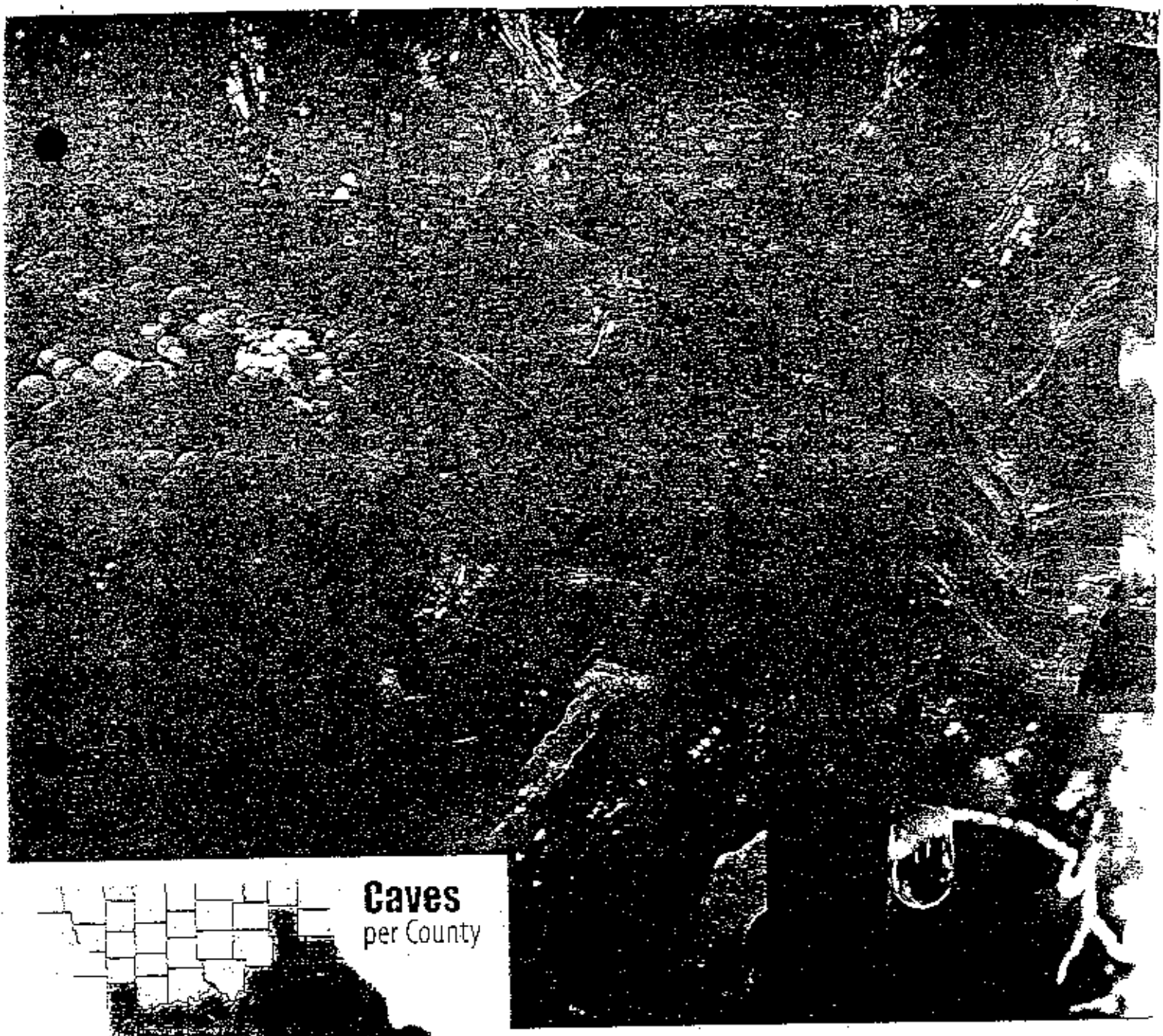
Imagine a landscape marked by limestone and dolomite ridges, dry hollows, caves, sinkholes, big springs, natural bridges, and streams that sink into their own beds. That's Missouri karst! The word "karst" comes from the German for the limestone region of Krš, Slovenia.

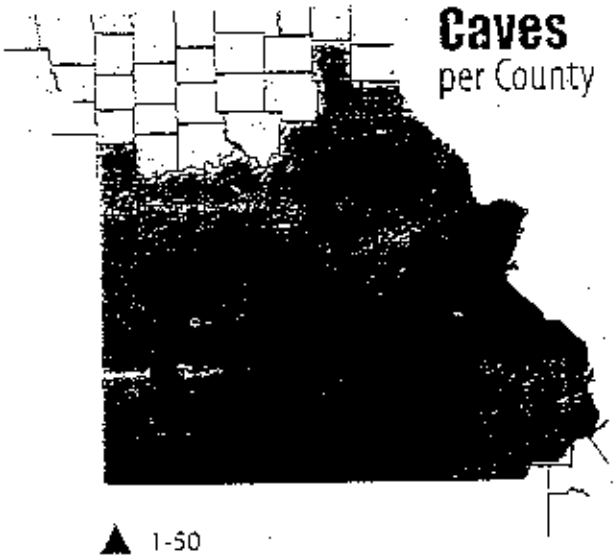
Missouri is known as *The Cave State* because of its large number of caves. At least 5,700 caves are recorded in the Missouri Speleological Survey's files in Rolla. Tennessee exceeds our count with 7,000 caves, but people discover about 125 new caves each year in Missouri. Certainly our caves are among the largest and most spectacular in the nation. There are caves in 78 of our 114 counties, mostly in the Ozarks, but some as far north as Hannibal.

Many of our ancient caves have passed through several lifetimes of development, starting with the dissolving action of slightly acidic groundwater on fractured bedrock. This natural plumbing enlarged because of collapse, canyon cutting by internal streams, accumulation of clays and gravels and re-excavation by streams. Drippings of flowing water laden with dissolved rock deposited calcite in these openings. The eventual fate of a cave is to erode away, as illustrated by natural bridges.

These events ranged over huge spans of time. The sea deposited Missouri's oldest cavernous rocks around 500 million years ago during the Cambrian Period.

Jim Hudgins



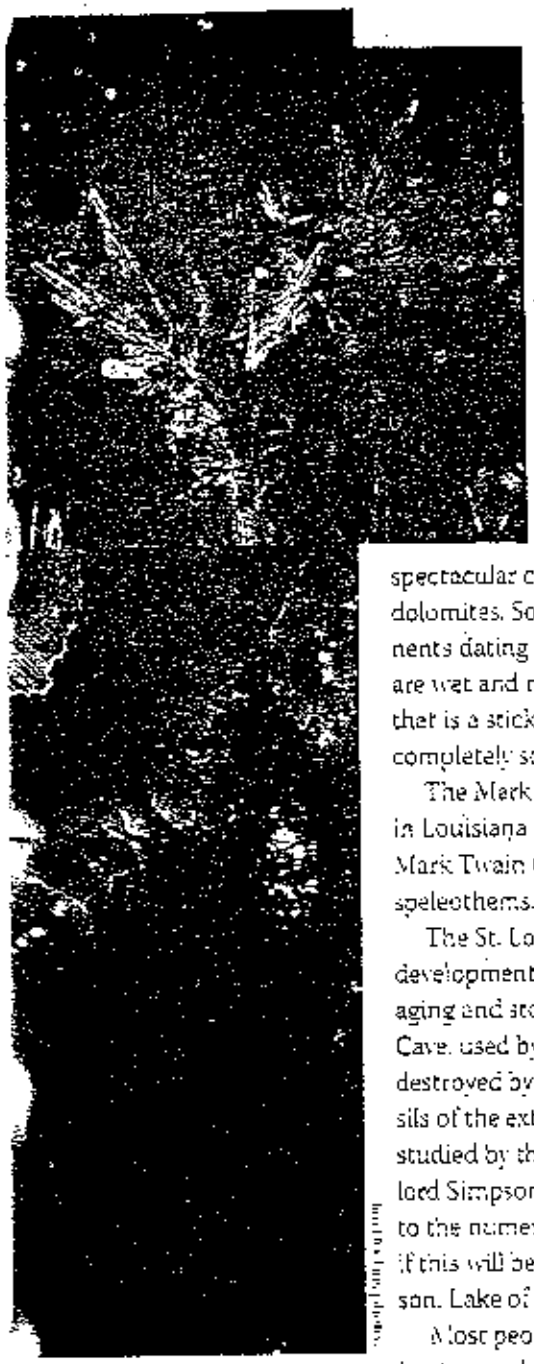


The Gasconade Dolomite of the Ordovician Period (around 450 million years old) is the most cavernous rock formation in Missouri.

In the Mississippian Period (about 350 million years ago), marine organisms created the Burlington/Keokuk Limestones which today are highly cavernous around Springfield, Columbia and northeastern Missouri. By the time the Cenozoic Era began 66 million years ago, Missouri had dolomite and limestone up to 1500 feet thick. At present, karst is developing rapidly, as evidenced by our large, deep springs and numerous losing streams.

The Perryville karst in Perry County has about 650 known caves, the most of any county in the United States. The caves are large, complex, flood-prone systems, and groundwater contamination is a growing problem in this area. Crevice Cave is the longest in the state at 28.2 miles. Berome-Moore Cave is an extensive system in which ancient cat tracks have been found.

The Springfield Plateau contains hundreds of relatively younger caves. Expanding urban areas threaten groundwater and the endangered Ozark cavefish. Some caves have beautiful speleothems, despite all the



Speleothems found in caves include (background) flowstone and (clockwise from far left) cave popcorn, aragonite bush and helictite tipped with crystalline needles.

mud, and cave structures tend to be fairly simple.

The largest continuous karst terrain is in south-central Missouri. The Salem Plateau is considered a cave factory with the oldest and most spectacular caves in the Gasconade and Eminence dolomites. Some caves may have paleocave components dating back many millions of years. The caves are wet and muddy with lots of "unctuous red clay," that is a sticky, slimy clay with no grit. This stuff completely stains cavers coveralls and gear.

The Mark Twain karst around Hannibal is formed in Louisiana limestone and Burlington limestone. Mark Twain Cave is an astonishing maze with few speleothems, and is open to the public.

The St. Louis karst is all but obliterated by urban development. German brewers used the caves for aging and storing beer in the 19th Century. Cherokee Cave, used by the Lemp brewery, was partially destroyed by highway building, but still contains fossils of the extinct flat-headed peccary, which were studied by the famous paleontologist, George Gaylord Simpson. When one considers what happened to the numerous caves under St. Louis, one wonders if this will be the fate of caves near Springfield, Branson, Lake of the Ozarks and other developed areas.

Most people know that speleothems, such as stalactites and stalagmites, take hundreds or thousands of years to grow. These cave resources are protected by state or federal law. But caves contain many fragile resources, such as bats, groundwater and many other phenomena that can benefit us educationally, scientifically and recreationally.

Since 1979 the Conservation Department has built its program of cave conservation, research, and education. We manage over 180 caves on state lands, and we extend a helping hand to private and federal landowners in studying and protecting their cave resources.

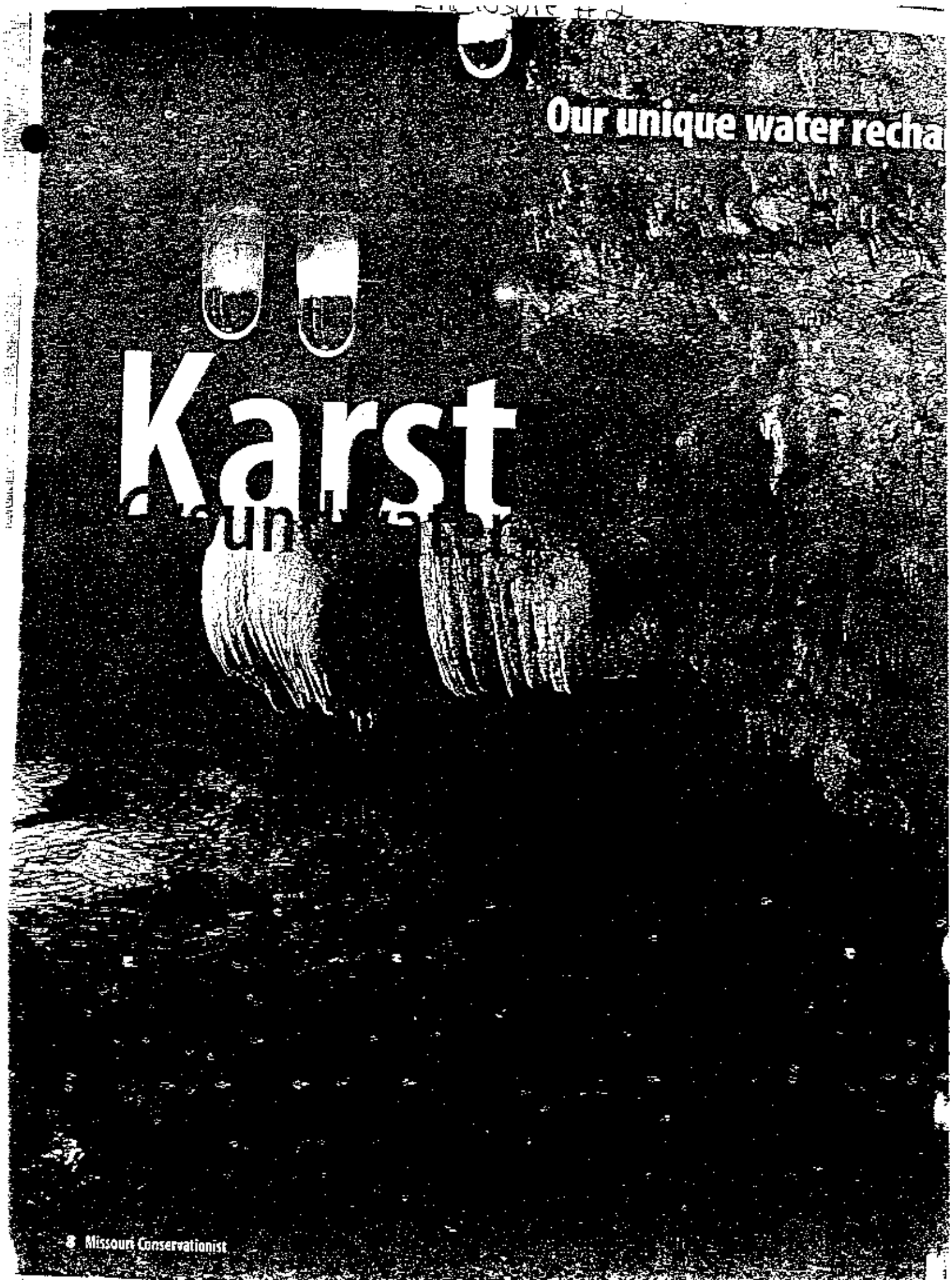
The Conservation Department has purposely acquired some caves that needed protection for endangered species, such a gray bats and Indiana bats. A few caves are protected for posterity, just because they are pristine examples of Missouri karst. Many of our caves are available for exploration, mapping and educational recreation, as are some caves on other public lands.

Even if one does not care much for caves, the groundwater issuing from our caves and springs is an important resource to Missourians. Our huge springs in the Ozarks feed important trout fisheries and provide rich habitat for wildlife. ▲

LEARNING About Caves

- ▶ Cathedral Cave at Onondaga Cave State Park (314/245-6600), near Leasburg, conducts science-education tours with headlamps on a good trail.
- ▶ Rock Bridge Memorial State Park, (573/449-7402), near Columbia, leads science adventure tours into the Devil's Icebox, via small canoes.
- ▶ The National Park Service offers educational lantern tours into Round Spring Cavern, near Eminence.
- ▶ The Ozark Underground Laboratory, a private research company near Protem, gives lectures to college classes on cave and karst conservation in Tumbling Creek Cave.
- ▶ Missouri has about 20 commercial show caves, which provide tours to the public (see web sites below).
- ▶ The Conservation Department offers cave ecology workshops at various sites. Teacher and caver workshops also are provided by the Conservation Department, the Cave Research Foundation and the Missouri Speleological Survey.
- ▶ Courses in speleology, caving and related topics are taught at Missouri Western State College, Southwest Missouri State University, The University of Missouri, Westminster College and others.

- ▶ American Cave Conservation Association: <http://www.cavern.org>
- ▶ Bat Conservation International: <http://www.batcon.org>
- ▶ Biospeleology: <http://www.utexas.edu/depts/tnhc/.www/biospeleology>
- ▶ National Speleological Society, Conservation & Management Section: <http://www.caves.org/section/cms>
- ▶ Ozark Caves: <http://www.umsl.edu/~joellaws/ozark_caving> and <http://cavern.com>


Our unique water recha
Karst
underwater

system brings pollution perils

by Tom Aley

Karst groundwater is an incredible natural resource. It provides drinking water for many of our residents, beautiful springs to feed our waterways and habitat for many unusual underground species. The quality of the groundwater is dependent upon how we use the land and how well we protect the quality of groundwater recharge.

An old adage is that whatever goes up comes down. In karst areas, whatever goes down, comes up—up through a cave, a spring or a well.

About three quarters of the water that reaches the major rivers in Missouri's karstlands has passed through groundwater systems for at least some distance. Karst is a landscape where underground water follows dissolved out channels in the rock. Sinkholes, springs, and caves are among the common features in karst areas.

Water that moves from the surface into the groundwater system is called groundwater recharge. Groundwater recharge replenishes wells, cave streams and springs.

Some groundwater recharge seeps and oozes through the subsurface, and in so doing receives fairly good natural cleansing. Other groundwater recharge occurs through a vast network of localized openings that are able to rapidly transport both water and contaminants. Water that seeps and oozes through the subsurface is called diffuse recharge. That which flows through localized openings is called discrete recharge.

From 1966 to 1973 I directed a watershed study for the U.S. Forest Service on Hurricane Creek south of Winona. Surface flow from Hurricane Creek enters the Eleven Point River while most of the underground flow from this basin discharges from Big Spring and flows into the Current River south of Van Buren.

We found that only about 25 percent of groundwater recharge was diffuse recharge; the remaining 75 percent was discrete recharge and was, therefore, not effectively cleansed.

Natural cleansing can be a misleading term—in many cases the underground openings are larger than the bacteria or parasites that cause waterborne illnesses in people and animals. Some discrete recharge zones cannot even filter out large materials such as acorns, walnuts, cans and pieces of styrofoam.

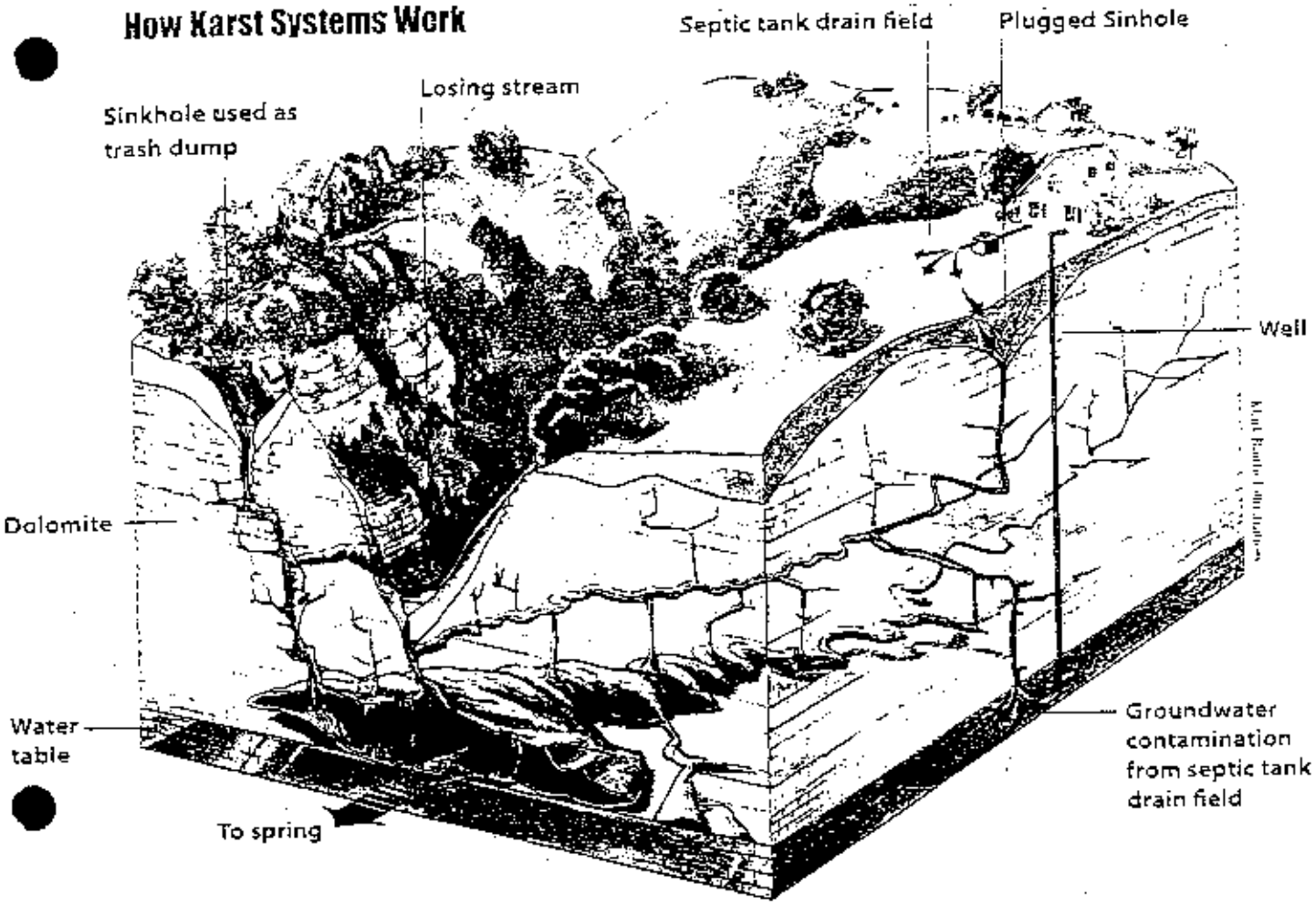
Sinkholes, which are depressions in the land's surface that have underground drainage, are abundant in some Missouri karst areas and rare in others. Their shapes are variable and range from bowl-shaped or elongated depressions to steep-sided natural funnels that may lead directly into cave passages and underground streams. Regardless of their shape, all sinkholes provide a direct connection between surface water and groundwater.

In a study in southern St. Louis County we simulated intense rainfall by using fire hydrants and hoses to introduce a 30-minute pulse of water and a harmless dye into a sinkhole. We then measured the response in the cave stream. We tested six sinkholes this way, and each accepted water faster than we could deliver it with a fire hose.

The recharge water from each sinkhole increased water levels at the sampling station on the cave stream in 45 minutes or less, even though the underground travel distances were as much as a quarter mile. Intense thunderstorms in the area would add water to all sinkholes at once, and would substantially increase the travel rates over what we observed in our study.

The typical Missouri cave exudes water from the base of a bluff. Cave water originates from many sources. Karst groundwater flows as if through conduits and is not filtered like water in sand aquifers.

How Karst Systems Work



Jim Rathert

Karst-created sinkholes collect runoff water that is often heavily laden with organic and chemical pollutants.

The experiment shows how rapidly caves and springs respond to surface runoff that enters the groundwater system through discrete recharge zones. Because intense rainstorms can cause rapid and lethal flash floods on cave streams, and water may totally fill passages, people should give careful consideration to the weather before entering caves.

Although sinkholes are easy to identify, other discrete recharge zones show little or no surface evidence of the direct connections between the surface and the groundwater system. If septic fields intercept such discrete recharge zones they contaminate the groundwater. In a karst area, the fact that "everything goes away" does not necessarily mean that a septic field system is adequately treating the sewage.

Losing streams are also discrete recharge zones. A losing stream is a surface stream that contributes water to the karst groundwater system in localized areas. In the Ozarks, almost every stream that lacks year-round flow has losing stream segments.

Losing stream valleys are important groundwater recharge zones in the Ozarks. Although valley areas represent about 10 percent of the land area, they are responsible for about 40 percent of the groundwater recharge to karst groundwater systems. Protection of water quality in these valleys is critical for protection of groundwater quality in wells and springs.

The typical losing stream in the Ozarks is a dry gravel stream bed, except for a few days or weeks after major rainfall. Many of the losing stream segments were once sinkholes that were filled with coarse stream gravel washed in during storm

flows. Losing stream segments can move a few gallons to a few hundreds of gallons per minute of water from the surface stream into the groundwater system.

One losing stream segment we studied made slurping sounds as it transported over a million gallons per day of poorly treated industrial sewage into the regional karst groundwater system. Contaminants sinking through this stream polluted rural wells and springs in a 60 square mile area.

Runoff from pasture lands can also degrade water quality via losing streams. Strips of ungrazed vegetation along stream channels, and especially along the normally dry losing stream channels, remove many contaminants from storm water. Even a vegetative strip as narrow as 50 feet wide along each bank of a losing stream channel is valuable in protecting groundwater quality.

Suburban and urban developments increase the quantity and decrease the quality of storm runoff water that reaches losing streams. When a storm hits, the vast majority of the contaminants are concentrated in the first quarter to half inch of storm runoff water. This "first flush" storm water runoff, often similar in quality to raw city sewage, enters our karst groundwater supplies through sinkholes or losing streams.

Developers often construct basins to detain storm water and reduce flash flooding in urban and suburban areas. However, most of these basins do not provide treatment to improve the quality of the detained water, and in some cases these detention basins have been located on top of losing stream segments. Improved storm water management approaches for urban and suburban activities are needed in Missouri's karst areas. Karst groundwater quality cannot be protected without ensuring good quality recharge water.

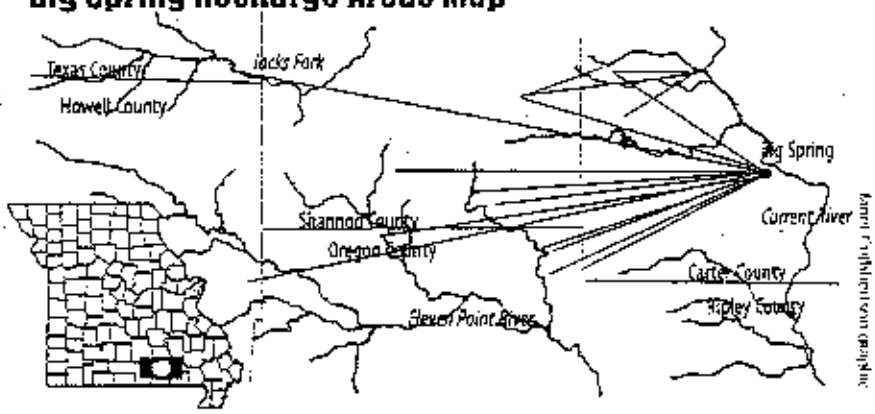
Karst groundwater systems provide habitat for many fascinating animals. Except for caves with large bat populations, most of the food for cave animals is washed in through discrete recharge zones. As a result, cave fauna is commonly concentrated around the points where these discrete recharge zones connect to caves.

Cleaning up groundwater, including karst groundwater, is routinely slow, difficult, expensive and seldom totally successful. As with most natural systems, damage is easy, fixing is difficult and prevention is best.

A fascinating characteristic of karst groundwater movement is the great speed with which much of the water moves. Karst groundwater travel rates in Missouri are often in the range of a mile per day. In non-karst areas, groundwater travel rates are commonly only a few feet per year.

The longest distance groundwater trace in the United States was from a losing stream segment of the Eleven Point River to Big Spring. Big Spring is 39.5 miles away and in the Current River basin. The dye introduced in the losing stream was first detected at Big Spring 16 days later.

Big Spring Recharge Areas Map



Dye tracking studies have revealed myriad connections between surface water and ground water, as can be seen on this map of the Big Spring recharge area. Water sometimes travels unbelievably fast through karst and is seldom purified during its passage.

Not all groundwater moves at the same speed. As a result, a contaminant may reach some springs or wells within a few hours or days of the time it entered the groundwater system, while the contaminant from the same source may not reach other wells for weeks or months. Travel times also depend upon characteristics of the contaminants. The net result is that cleaning up groundwater, including karst groundwater, is routinely slow, difficult, expensive and seldom totally successful. As with most natural systems, damage is easy, fixing is difficult and prevention is best.

Another unique feature of karst groundwater systems is that water entering the subsurface at a single point may sometimes discharge from multiple springs and wells. The discharge points are sometimes in different stream or river basins and may be separated from one another by a number of miles. Such complex flow systems help explain the relatively large ranges for some aquatic cave species. The range of Ozark cavefish, for example, extends from Springfield southwestward into northwest Arkansas and northeast Oklahoma. ▲

Chris McClarren
3836 Fillmore
St. Louis MO 63116

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Mr. Stephen McCracken, Project Manager
Weldon Spring Site - DOE
7295 Hwy 94 South
St. Charles, MO 63304

August 14, 2000

Mr. Stephen McCracken, Project Manager
Weldon Spring Site - Department of Energy
7295 Highway 94 South
St. Charles, Mo. 63304
Fax 1-636-447-0739

Re: Clean up of Weldon Spring Radioactive Groundwater

Dear Mr.McCracken:

I am writing as a concerned citizen, requesting that clean-up efforts at Weldon Spring include clean-up of the groundwater to safe drinking water standards.

It is my understanding that DOE is proposing to only treat the groundwater for trichloroethylene (TCE) with no guarantee that this will be continued until acceptable standards are reached. Also, DOE proposed NO treatment for the radioactive contamination (uranium) or the explosives waste in the aquifer. I understand that technologies are available that can remove much of the radioactive and hazardous waste from the groundwater. I consider it essential that these current technologies be applied to eliminate the hazards at this site.

Sincerely,

Diana Holman
111 Rutherglen Dr.
Valley Park, Mo.

024664

A Bolman
111 Rutherglen Dr.
Valley Park, Mo.
63088

2000

USA 33¢

Weldon Spring Site - Dept. Energy
Mr. Stephen McCracken, Manager
7295 Highway 94 South
St. Charles, Mo. 63304

63304+2203

3507 Laclede Ave.
St. Louis, MO 63103-2010
314-977-3900
FAX: 314-977-3658

SAINT LOUIS
UNIVERSITY

Department of Biology

August 15, 2000

Mr Stephen McCracken
Project Manager, Weldon Spring Site
US Department of Energy
7295 Highway 94 South
St. Charles, MO 63304

Dear Mr. McCracken:

I wish to protest the intention of the DOE to **shut down its cleanup program** of the radioactively contaminated groundwater from the Mallinkrodt Chemical Works at Weldon Spring. Although I am speaking as an individual, my scientific background has taught me that the effects of environmental insults on the human body are often silent and the potential danger is easily misjudged. Compared to the amount of money that was spent on development of uranium and thorium for nuclear weapons and the cost of building and deploying them, how can the DOE say the cleanup effort is not cost-effective? What is our health and the health of our children worth? Water from the Weldon Spring site flows into the Missouri River and eventually into the water we all drink and neither I, nor anyone else, knows exactly how it will impact our health and that of our unborn children. The dangers of radiation exposure, even in small amounts, that were not deemed dangerous in the past, now have proved to be life-threatening; I see reports in the newspapers frequently about the lethal effects of exposure to contaminants which were not considered hazardous by the US government at the time. If the citizens of the state were to be informed of the **possible** future risks, would they consider cost-effectiveness a legitimate concern? I'm sure they would want radioactive-free, noncontaminated water no matter what the price.

The other objections of the DOE to cleaning up the contaminated ground water is that it is "technically impracticable". Technological advancement in our society is evident every day especially in terms of communication, computers, etc. If the scientific community were aware of the need for improved water treatment methods and were given incentives for development of improved technology, there is no doubt that it could be accomplished. Do not close the door to clean, noncontaminated water; it is far more important than many other environmental issues and deserves our best shot. The stunning technological expertise that exists today surely can come up with ways to reduce the hazards of the groundwater at the Weldon Spring site and the citizens of Missouri want and deserve water that will not make them ill in the future.

Sincerely yours,

Judith Medoff

Judith Medoff, Ph.D.
Professor of Biology

024665

Dr. J. Medoff

SAINT LOUIS UNIVERSITY

Department of Biology
3507 Laclede Ave.
St. Louis, MO 63103-2010

33USA

Mr. Stephen McCracken
Project Manager
Weldon Spring Site
Department of Energy
7295 Hway 95 South
St. Charles, MO 63304

556 Oakhaven Lane
Creve Coeur, MO. 63141
August 13, 2000

Stephen McCracken
Project Manager
Weldon Spring Site Remedial Action Project Office
7295 Hwy 94 South
St. Charles, MO 63304

Dear Mr. McCracken:

I urge you not to terminate clean-up operations at Weldon Springs until the ground water there has been decontaminated of radioactive isotopes and other industrial chemicals such as Trichloroethylene to levels acceptable for drinking water.

Because of the dangers associated with migration of contaminants into the drinking water sources for this metro area, the contaminants must be eliminated.

Citizens of this metro area were not the ones who decided to locate the nuclear operation in our midst. Therefore, we should not be the ones to suffer from, or pay the price of, the resulting contamination, other than as federal taxpayers. The federal government is responsible for the original decisions and should accept responsibility for total clean-up.

Thank you for your consideration.
Sincerely, Virginia Harris

024666

556 Oakhaven Lane
Creve Coeur, Mo.
63141-7613

USA 1¢

Weldon Spring Site Remedial Action Project Office
7295 Hwy 94 South
St. Charles, MO. 63304
attn: Stephen McCracken, Project Manager

63304+2203

August 14, 2000

Stephen McCracken, Project Manager
Weldon Spring Site Remedial Action Project Office
7295 Hwy. 94 South
St. Charles, MO. 63304

Dear Mr. McCracken,

I was surprised and disappointed to learn that the Department of Energy is not planning to treat the ground water at the Weldon Springs site for radioactive contaminants. The presence of elevated levels of uranium and other radioactive contaminants in Burgermeister Spring is evidence of the migration of the wastes from the Weldon Springs site which is obviously a threat to the area's ground water. Naively, I had assumed that cleaning up the ground water was part of the original remedial action plan.

I believe that the Department of Energy should clean up all sources of contamination in the groundwater until drinking water standards are met. As a concerned citizen, I believe that remedial efforts at Weldon Spring should continue until the groundwater is cleaned up of all contamination which include radioactive isotopes, such as uranium and radium, as well as trichloroetylene and TNT. If the groundwater is left untreated, it will continue to pose a threat to the area's ground water which puts at risk people using private wells, as well as the residents of St. Charles County and potentially anyone who drinks water from the underground aquifer. Both present and future generations of people as well as plants and animals are placed at risk. The contaminated water must be pumped out of the ground, treated to remove all of the contaminants and then returned to the ground. I understand the difficulties which karst topography of the area poses, but time should not be a factor in the clean up due to the long half-line of uranium.

Every effort must be made to clean up the water, so that the basic need for water of present and future generations is not compromised. The dilution which occurs as the contaminants continue to migrate through the ground water is not an acceptable solution to this problem. Thank you for your concern for present and future generations.

Sincerely,

Kathy Lewis

Kathy Lewis
120 Cornelia Ave.
St. Louis, MO 63122

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AUG 16 2000

Lewis
120 Cornelia
St Louis, MO 63122

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To: Stephen McCracken, Project Manager
Weldon Spring Site Remedial Action Project Office
7295 Hwy 94 South
St Charles, MO 63304

18318 Rieger Rd.
Wildwood, MO 63005-8429
Aug. 14, 2000

Stephen McCracken, Project Manager
Weldon Spring Site Remedial Action Project Office
7295 Hwy. 94 South
St. Charles MO 63304

Dear Mr. McCracken:

Clean up the groundwater in the Weldon Spring site, please. I have 14 grandchildren, nine of whom live in west St. Louis County. Odds are that some of them will live in St. Charles County in the future, they will need guaranteed clean water to drink.

Groundwater, by its very nature, moves unpredictably. This year's solid rock may be next year's active fault zone. The deeper the contaminated water goes, the more expensive it will be to clean it up years, or generations, from now.

Explosives wastes, radioactive contamination, raffinate pits must be treated until they are clean.

Please do not end your remedial efforts at Weldon Spring until the groundwater is completely cleaned of all contamination.

Thank you for all you have done there. Please do not quit until it is really, really finished.

Sincerely yours,

Louise H. Belt

Louise McKeon Belt
(Mrs. Charles Banks Belt, Jr.)

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Louise Belt

Mr. Stephen McCracken, Manager
Weldon Spring Project
7295 Hwy. 94 South
St. Charles
MO 63304

C. Savage

To: Yvonne Deyo - DOE Project Weldon Springs Project PAI, Corp. - 636-447-0739
Kay Drey - Citizen - 314-725-7676
Larry Erickson - MO Dept of Natural Resources - 573-526-5268
Gene Gunn - U.S. EPA Region IV Kansas City, KS - 913-551-7063
Tom Pauling - DOE Project Weldon Springs Site - 636-447-0739
Dan Wall - U.S. EPA Region VI Kansas City, KS - 913-551-9710

Attached is a fax of the comments I submitted yesterday..

Please feel free to call me for any reason... My major points :

1. DOE does not have to worry about being able to collect ground water from the site because of the formation...the God given springs in the area have provided that collection. Radioactive and chemical tracers (and the Potentiometric surface maps) prove that their water comes from the contaminated field... Mother nature has taken care of the "pump" part of a "pump and treat" remedy. Yes, we have plenty of contaminated water to treat...Whether or not it is safe enough to release without treatment, is another matter.

   From a public acceptance standpoint, a pilot plant to develop/evaluate cost effective treatment for these streams would tell the public DOE is continuing to work to reduce radioactive and chemical releases from the site...search for improvements...and not just waiting for five years to see if any thing new has been developed.

2. I suggest that much of the public concerns from the potentially affected areas results from not having much data to prove that exposure is safe today and lack of confidence in the sampling protocols. (The water shed to Dardenne Creek, St. Peters ,etc.) Also, those people may not like the thought of there being continuing releases of water to their areas which contain man-made radiation at levels which exceed drinking water standards....and/or those being proposed.

   A DOE sampling program (with agreed upon protocols) coupled with "risk modeling based on possible exposure routes" and communications of all results to public might build trust and relief any anxiety that might exist.

Thanks again for your responsiveness to my questions. Much good work has gone on.... These comments are simply for consideration.

Garth Fort

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AUG 17 2000

Burton A. Shatz, M.D.
Leonard B. Weinstock, M.D.
Erik P. Thyssen, M.D.
Giuseppe Aliperti, M.D.

SPECIALISTS IN GASTROENTEROLOGY

August 10, 2000

Steve McCracken
Weldon Springs Site DOE
7295 Highway 94 South
St. Charles, MO 63304

Dear Mr. McCracken,

It was brought to my attention that the radioactivity of the ground water is becoming a major problem. As a gastroenterologist, I see a lot of water induced gastrointestinal disease and certainly radioactivity is a major issue. Please make all efforts to clean up this Weldon Springs drinking water.

Sincerely yours,

Leonard Weinstock, M.D.

LW:jw

024670

10287 Clayton Road • Suite 200 • St. Louis, Missouri • 63124 • Tel (314) 997-0554 • Fax: 997-5086

AUG 17 2000

Burton A. Shatz, M.D.
Leonard B. Weinstock, M.D.
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Giuseppe Aliperti, M.D.

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10287 Clayton Road
St. Louis, Missouri 63124

Steve McCracken
Welson Springs Site DOE
7295 Highway 94 South
St. Charles, MO 63304

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9819 Mar-Ann Court
St.Louis, Missouri 63128
August 15, 2000

U.S. Department of Energy
Weldon Spring Site Office
Attn: Steven McCracken
7295 Hwy 94 South
Saint Charles, Missouri 63304

Re: Public comment regarding ground water remediation of Weldon Spring Site, Groundwater Operable Unit, Weldon Spring, Missouri

Dear Mr. McCracken:

I appreciate the opportunity to comment on the pending implementation of remediation techniques to continue treating the groundwater contamination at the Weldon Spring facility. I have reviewed the documents supplied to me (Feasibility Study...12/98, WSS Environmental Report...1999) and would like to make the following comments.

Throughout the Feasibility Study, the monitoring wells are used to provide contamination data to indicate the degree of treatment necessary for the contaminants of interest. These wells historically have provided some questionable data, however (FS p. 1-23 and ER p. 124). In addition, they provide water samples from sections of strata that might be too large to avoid the possibility of dilution of contaminant concentrations. If contaminated groundwater is perched on an impermeable layer, then a small screen (6" to 12") would be necessary to measure water only at that specific vertical location. It is my understanding that such screen design is not being used currently. Obviously, a series of wells with screens at incremental depths would be needed to provide accurate contaminate indications.

The significance of accurate and shallow-to-deep monitoring is obvious, given the possibility of surface contamination affecting the (apparently) pristine groundwater in deeper strata. Municipal wells exist down gradient (note FS fig. 1-2 and 1-6), and future use of groundwater may occur in the remote future, at a time when current contamination documentation is long since lost.

For these reasons, as well as the karst topography at the site, further investigations of vertical contamination migration should be implemented to ensure that all potential detrimental effects of

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AUG 17 2000

the surface contamination on deep groundwater will be understood, and appropriate remedial action will be taken. The Feasibility Study notes that certain remediation techniques are compromised by the Karst formations (p.2-10). Perhaps the proper remediation technique will entail a "holding action" plan until new technologies evolve to provide adequate remediation, but this effort is preferable to ignoring such a problem.

I appreciate the opportunity to respond to these documents, and hope that I can be of further assistance. My work in the water supply industry and my recent efforts on the citizen's advisory panel associated the SLAPS site near Lambert Airport has made me very interested in DOE's efforts to address the contamination problems at Weldon Spring. I look forward to obtaining further information on DOE's progress.

Sincerely,

Donovan Larson, P.E.

Copy: Region VII USEPA

9819 Mar-Ann Ct.
St.Louis, Missouri 63128

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15 AUG
2000

U.S. Department of Energy
Weldon Spring Site Office
Attn: Steven McCracken
7295 Hwy 94 South
Saint Charles, Missouri 63304

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August , 2000

Mr. Stephen McCracken, Project Manager
Weldon Spring Site - Department of Energy
7295 Highway 94 South
St. Charles, Mo. 63304
Fax 1-636-447-0739

Re: Clean up of Weldon Spring Radioactive Groundwater

Dear Mr.McCracken:

I am writing as a concerned citizen, requesting that clean-up efforts at Weldon Spring include clean-up of the groundwater to safe drinking water standards.

It is my understanding that DOE is proposing to only treat the groundwater for trichloroethylene (TCE) with no guarantee that this will be continued until acceptable standards are reached. Also, DOE proposed NO treatment for the radioactive contamination (uranium) or the explosives waste in the aquifer. I understand that technologies are available that can remove much of the radioactive and hazardous waste from the groundwater. I consider it essential that these current technologies be applied to eliminate the hazards at this site.

Sincerely,

Rick Cox

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AUG 17 2000

8/14/00

Mr. Stephen McCracken, Project Manager
Weldon Spring Site - DOE
7295 Highway 94 South
St. Charles Missouri 63304

Dear Mr. McCracken,

For the health of all St. Louis residents, I urge you to clean up the contaminated ground water at Mallinckrodt Chemical Works at Weldon Spring. There is no way long term monitoring can be guaranteed when the half-life of uranium-238 is 4.5 billion years and the half-life of thorium is 14.1 billion years, just to name a few of the contaminants at Weldon Spring.

I think St. Louis residents deserve clean, safe drinking water. Please do everything within your power to make sure we have it.

Thank you.

Sincerely,

Roberta J. Lutwein
7415 York Dr
St. Louis MO 63105

0-246-74
AUG 17 2000

G Ms. Roberta Gulwein
7415 York Dr
Saint Louis, MO 63105

Mr. Stephen McCracken, Project Manager
Weldon Spring Site - DOE
7295 Highway 94 South
St. Charles MO 63304

63304+2202

Cassandra

OFFICE OF THE MAYOR
CITY OF ST. LOUIS
MISSOURI

CLARENCE HARMON
MAYOR

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1200 MARKET STREET
SAINT LOUIS, MISSOURI 63103-2877
(314) 622-3201
FAX: (314) 622-4061
harmon@stlouis.missouri.org

August 18, 2000

Mr. Dennis Grams
Regional Administrator
Environmental Protection Agency
Region VII
901 N. Fifth Street
Kansas City, MO 66101

Mr. Stephen H. McCracken
Project Manager
United States Department of Energy
Weldon Spring Site Remedial Action Project
7295 Highway 94 South
St. Charles, MO 63304

Dear Messrs. Grams and McCracken:

I am writing to express my strong concern with the proposed plan for the groundwater cleanup at the Weldon Spring site. As Mayor, my first responsibility is to protect the health and welfare of the citizens of the City of St. Louis. The Weldon Spring project has the potential to negatively affect not only my constituency, but citizens throughout our metropolitan area. I know that my concern is shared by chief elected officials in St. Louis County and St. Charles County and by the Missouri Department of Natural Resources. In addition, both the St. Louis City Board of Aldermen and the St. Louis County Council have recently passed resolutions on this crucial issue.

Weldon Spring is part of a major watershed that serves the entire metropolitan St. Louis area. The groundwater from this site flows into the Missouri and Mississippi Rivers that serve as primary sources for the entire region's drinking water, including the City of St. Louis. The site is upstream from the City of St. Louis, making our citizens especially susceptible to risks posed by runoff at Weldon Spring. It is incumbent upon the federal government to ensure

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AUG 30 2000

our residents' protection from the contaminated groundwater emanating from this site.

It is my hope that the federal government will illustrate to state and local officials that it has evaluated *all* of the possible options for proper remediation of the site. I would also hope that you will ensure that only the most updated and effective technologies will be employed in the implementation of any cleanup plan.

Like many of this nation's urban centers, the City of St. Louis currently faces many budget challenges. I, therefore, must stress the importance of DOE and EPA identifying a stable funding stream and mechanism for perpetual maintenance and oversite at Weldon Spring. I would be extremely dismayed if at sometime, in the near or distant future, local and state officials were asked to find a way to foot the bills for continued maintenance at the Weldon Spring site. We, in the City of St. Louis, already have numerous environmental projects that require our prioritization and resources, it would be unacceptable for Weldon Spring to be added to the list.

During my tenure as Mayor, we have successfully collaborated with the federal government on many projects. This administration has proven its concern for major metropolitan areas and has demonstrated its commitment to being a good neighbor. We look forward to a resolution of this issue that benefits all of our citizens.

Thank you for your attention and consideration in this matter.

Sincerely,

Clarence Harmon
MAYOR

sma