GWOU ADMINISTRATIVE RECORD
SECTION TITLE:
GW-800-801-1.17

Comments on the "*Proposed Plan for Remedial Action for the Groundwater Operable Unit at the Chemical Plant Area of the Weldon Spring Site, Weldon Spring, Missouri*" dated August 2003

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Public Meeting August 13, 2003
Weldon Spring Interpretive Center

by

DANIEL W. MCKEEL, JR., M.D.

(Amended and extended oral remarks
based on the discussion at the 8/13 meeting)

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ORAL COMMENTS
Daniel W. McKeel, Jr., M.D.
August 13, 2003

1. Like the original August 9, 2003 LTSM document, this PP is too brief and lacks many essential details. It, too, appears to be very premature and incomplete. In particular, the sections on pages 14-15 dealing with triggers and contingency plans where DOE and MDNR differ totally lack specifics. Examples: (a), page 15, "Within the plumes, the trigger concentrations will be representative of historical highs"; (b) At the springs, the trigger concentrations will consider health-based values and historical trends." This type of wording is so vague that no regulatory or sicientifc meaning flows from it -- what are "health-based values", for instance? How will historical highs actually be used to set triggers?

2. There has been no opportunity thus far for general public comments on the process whereby remediation alternatives have been selected (see 3).

3. The **three chosen Alternatives do not encompass all reasonable, tested scientific options**. I favor a Fourth Alternative, active treatment based on latest technology, using the GW remediation at the Fort Lewis, Washington Superfund Site as a model to achieve unrestricted use in 40 years versus the preferred Alternative 3 that will take 100 years to comply with ARARS.
   • **I have the perception that cost and time were given undue consideration over protecting the public health and the environment**. These are goals that DOE, EPA and MDNR all endorse on paper but do not fully support as judged by the weak groundwater remediation efforts over the past several years since the public demanded remediation be attempted. Judged on performance achieved, a low performance score is merited based on the pilot study results.

4. I offer as proof of statement [2] the selected groundwater remedy chosen at the Fort Lewis, WA Superfund site where uranium and TCE are also major COCs. There, multiple innovative GW treatment options are being employed to reduce the original estimate to return the site to unrestricted use from 60 to 40 years. Alternative 3 offered in the PP for Weldon Spring will take 100 years to satisfy all ARARS, an *unacceptably long period of time*.

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NOTE: I was cut off from speaking at this point by the facilitator

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5. The **Interceptor Trench design** was poorly engineered from the outset so that only only one of three sump pumps removed significant uranium-bearing groundwater. The excuse offered that the two year test period was especially dry

- (low rainfall) is not valid. Weather conditions in this area could have been forecast more accurately and a design made that allowed all 3 pumps to

operate effectively. This was not done, and EPA, DOE and MDNR in concurring on the design and its implementation are at fault for not giving this proven and establsihed remediation technology a better try.

• In addition, the initial amount of total uranium burden was recalculated from 85 to over 1,400 kg near the end of the two year trial period. Using the original figure, the 10.6 kg removed would have surpassed the 10% threshold based on the 85 kg original estimate of total uranium burden. The trench strategy would then have had to be scaled up for long term treatment. Instead, DOE recalculated the starting amount, making the result achieved less than the 10% trigger point for further remediation. This raises concerns the start level was adjusted specifically to obviate the need to employ trench technology for long term remediation of the groundwater.

• Further fuel for the speculation that the Interceptor Trench work was not meant to meet goal, is the way DOE rapidly dismantled the trench over strenuous objections by MDNR. The Weldon Spring Citizens Commission and EPA stood by and acquiesced in this disappointing maneuver which was not justified at all to the general public. It was just done prematurely and furtively with little or no public discussion, like the proverbial Biblical "thief in the night."

• U.S. DOE owes the public an explanation for this premature destruction of a potential public and state asset. The Interceptor trench tool might become useful again in the future if certain still undefined trigger conditions and contingency plans require further uranium remediation in the future (see [1]).

6. The TCE oxidation attempt was partly successful and TCE was neutralized, but was the pilot work optimally designed to achive maximum remediation of the TCE? Again, one can turn to the Fort Lewis paradigm. It becomes clear that TCE oxidation treatments would have to be employed for several decades rather than the foreshortened test period that was actually employed and then on PP page12 are summarily dismissed: **"(quote) Active treatement alternatives have been thoroughly investigated and discarded as ineffective. (endquote)"**.

7. During several long term stewardship public workshops, representatives from MDNR exhorted DOE to employ new and emerging technologies at Weldon Spring site. Yet the pump and treat and TCE oxidation methods of old alone were employed. It is estimated that 80% of atomic weapons related Superfund sites have contaminated GW, and TCE and uranium are common COCs. Why, then, have the newer technologies being employed successfully at such sites as Fort Lewis in Washington not been explored at WSS?

8. I am puzzled why the uranium contamination of GW lying beneath Katy Trail is not addressed in this proposed plan? Is this the PP for all GW at *both* The WSS and former WSOW sites? This is not clear in the PP.

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9. The usage of warning signs as Institutional Controls should be addressed explicitly. The public has an absolute Right To Know the specific GW contaminants. The argument there is no risk is fallacious, otherwise there would be no need for monitoring or ICs -- *Res Ipsi Loquitor* -- "the thing speaks for itself." There is no low dose radiation threshold--any dose poses some risk.
   - I reject EPAs concept that an arbitrary Health Index of 1.0 should be a trigger point for addressing potential harm to human health. Why? Because the assumption that we begin at a baseline of 0.0 (zero) is untrue. We all carry complex bodily burdens of pesticides, harmful chemicals and the cumulative radiation burden of the too-often cited **300 mrem annual "natural background" exposure**, plus other amounts accrued through numerous diagnostic mammograms, GI studies, chest x-rays, etc. In short, I believe both DOE and EPA often grossly underestimate human risk, relying too much on the calculations of Health Physicists who are just that, experts on radiation doses, but not necessarily even radiobiologists who have carried out radiation experiments in animal models. Only physicians in our society are legally qualified to make medical diagnoses of human illnesses, to prescribe medical treatments for humans, and have the real world training to fully understand the potential harm due to chemical and radiation-induced diseases through hands-on experience with people under their care.
   - Where are the licensed MDs in this process? ATSDR rendered health assessments in 1995 and 1997, but this was years before DOE admitted recycled uranium had been used at Mallinckrodt-AEC sites, or when TCE contamination of GW was first noted at Weldon Spring Site. The two ATSDR health assessment reports of 1995 and 1997 did not cover these substances at all. RU implies the presence of transuranics such as plutonium and technetium, traces of which have been demonstrated at Weldon Spring Site.

10. The paragraph on page 7 of the PP beginning "The Missouri Department of Health..." is referenced on page 18 (Basko) as an e-mail communication with B. Cato at WSSRAP dated May 22, 2003. **I obtained a copy of this e-mail communication under the Missouri Sunshine statute.** I was surprised to learn that EPA had suggested that this language be inserted in the PP, and that DOE had written this exact language before DHSS had transmitted the relevant data files to them. I further discussed this issue with Mr. Gale Carlson of DHSS who supervises Ms. Basko. My concerns about the validity of this statement remain until I am allowed to examine all well test data on which the claim is based.

11: The PP does not explicitly document the nature and threats to human health and the environment of uranium, TCE, nitrates and nitoraromatics, the principal GW COCs. This deficit in the report needs to be addressed. Physicians with MD degrees, in addition to Health Physicist Ph.D.'s, should be involved in writing and peer-review editing of this section of the PP. ATSDR and Missouri

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DHSS might be called upon in this regard. DOE should fund further monitoring of adverse health effects to the fish in Busch Conservation area lakes 34-36 and in the Femme Osage slough since both are used by the public for fishing, and the fish are consumed as food. However, human health monitoring is far higher on my personal priority list.

--- end of 8/13/03 oral remarks ---

Additional Remarks About The Proposed Plan Submitted In Writing Only

General comments on the commenting process

The 8/13/2003 public comment meeting did not meet the spirit of CERCLA in several key ways: (a) time for public comment was insufficient (3-4 minutes allocated per commentor), (b) agencies were allocated too much time, the meeting was ostensibly to solicit public comments, (c) no one needed to be cut-off in the midst of their remarks as was I, (d) the general public was not allowed to participate in the selection of alternatives, thus an active one was not presented to them to comment upon, (e) the use of a reponse summary, as is proposed for this Proposed Plan and Support Evaluation, instead of verbatim reporting of comments and answers (such as was done for the WSS long-term stewardship Aug 9, 2002 draft, for example), is unacceptable and will result of deletion from public scrutiny of many important comments that should be presented in full.

p. 2 mentions "two former dumps". One is the Quarry, what is the other one?

p. 2 Figure 2, Lake 36 should be labeled.

p. 3 TCE is 1 microgram/L in spring 6303. If this is true, explain how it could be that TCE has never appeared in Burgermeister spring 6301.

p. 3 Nitrates "exceed the MCL" ... "at locations on the MDOC property". What are the other locations besides Burgermeister spring 6301 and SED?

p. 4 Add a discussion of the chemical and radiologic adverse effects on human health and the environment of GWOU COCs.

p. 5 Isn't paragraph 1 a description of "karst" (porous) topography? We disagree that 5 ft = "small" with respect to water carrying COC's—I feel this is very large. Karst fractures are both horizontal and vertical.

p. 5 Column 2, middle of page, 3 aquifers communicate, provide documentation of extent.

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p. 6 Busch Lake numbers should be added to Figure 3.

p. 6 Figure 3. How could TCE be in spring 6303 but not in 6301 a short distance away? What is DOE's explanation? Were both 6303 and 6301 simultaneously sampled for TCE at the time TCE was detected in 6303?

p. 6 Bottom of page says "no groundwater contamination attributable to the Chemical Plant is present south of the divide." Question: where does the SED COC contamination come from if that is the case?

APPENDIX A - The COC contours are in 2-dimensions only; they should be rendered in 3 dimensions as was done for the Fort Lewis, WA uranium plume.

- **Comment and Question**: I asked for, and was promised 3-D plume maps for uranium in particular by MDNR and St. Charles county but these were never delivered and still apparently are unavailable. Does this indicate DOE and the other agencies lack sufficient vertical dimension plume test data to make the 3-D plots? Or is there some other explanation? If it exists, it should be added to all contour COC maps.

I ascribe to all of the comments and suggested Proposed Plan revisions suggested by MDNR in their May 13, 2003 detailed comments.

Respectfully submitted (via e-mail and Fax plus mailed hard copies),

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Part II. Comments on the "Supporting Evaluation for the Proposed Plan for Final Remedial Action for the Groundwater Operable Unit at the Chemical Plant Area of the Weldon Spring Site, Weldon Spring, Missouri (August 2003)", DOE/GJ79491-934 by Daniel W. McKeel, Jr., M.D. (submitted 9/03/2003)

pp 1-4. Several active groundwater remediation technologies that have been used successfully elsewhere to remediate groundwater with uranium, nitrates, TCE and nitroaromatics (bioremediation, phytoremediation, for example) are not mentioned. The exploration of active remediation alternatives at WSS was neither comprehensive nor sufficiently intensive. More could be done and should be done and active remediation strategies should not be "dismissed" in this section, in the Proposed Plan, or in the Final GWOU Record of Decision (ROD) yet to be issued.

pp 5-22, Section 2. Site Background

pp. 7-12 COC "contour" maps depicted in Figures 2.2 - 2.7. The figures should be accompanied by 3-D plume maps for each of the same COC's to show the vertical as well as horizontal dispersion of each COC plume. I support the recommendations of both MDNR and MDOC made at the 8/13/03 public meeting in this regard. Further, there should be some indication how many data points are represented, and how such data were obtained, to define the vertical extent of each plume.

p. 14, section 2.1.2. Additional text needs to be added to indicate the water flow apparatus at spring 6301 (Burgermeister) is or is not currently operative to indicate high and low flow conditions (or that it will be repaired and when this will be done).
I was told by Steve Lang of MDNR on March 14, 2003 while inspecting the SED and spring 5304 that this instrumentation was out of service and in need of repair.

p. 15, section 2.2.1. The second paragraph about the relationship between the three regional aquifers should be amended to indicate the vertical extent of communication between the three for groundwater and COCs. Existing data showing the amount of flow (in percentages, for example, for uranium), or concentration gradients, that exist between the superficial, intermediate and deep aquifers should be indicated and how this data was obtained. The number of data points should be stated. The phrase "Groundwater movement is controlled primarily by horizontal ..." should be clarified more exactly as to the vertical movement of GW. Pages of paper may be 2-D, but the real world, including contaminant plumes, is 3-D! This fact has been ignored way too long in graphic representations of groundwater aquifers at Weldon Spring Site for both the Chemical Plant and Quarry sites.

p. 16, Figure 2.8. This is a map of springs and drainage areas in the Chemical Plant area. The two creeks and springs on either side of SED should be named and numbered for accurate identification purposes. The **black dot north of U.S. route 40/61, Spring 6306**, was monitored routinely by DOE up until 1995 and has been since 2000 by both DOE and MDNR at the request of O'Fallon citizens. In the LTSM

interim draft, 6306 will be monitored for an unlimited time in the future because it is located in a heavily populated, growing residential area. The spring number should be added beside the black dot just as springs 6301 and 6303 in the same "6300" drainage are labeled. Also, **Lake 34** fed by 6303 and 6301 which in turn feeds 6306 should be labeled in the map. In fact, all of the streams, and Busch and Weldon Spring Conservation Area **Lakes 33, 35 and 36** (at least), should be labeled so that more exact locations of these important recipients of GW runoff can be identified by users of this report.

p. 17, section 2.2.1. The meaning of the last sentence in the first paragraph that "data from the groundwater downgradient of the springs indicate no impact" is unclear. Spring 5304 is barely visible on the SED creek bank and is only a few hundred yards from where SED crosses the Katy Trail. So where was the actual "groundwater downgradient" sampling point/s that were measured to support the validity of this statement? Does the sentence mean that contaminated GW flows from spring 5304 into SED and is then immediately diluted--please clarify which direction (towards the Missouri River?) is downgradient.

p. 17, section 2.2.2. The description of creeks and streams receiving Chemical Plant groundwater does not include any information about current concentrations of COCs except SED which is only one of many that are potentially or actually impacted). How recently have COC's been monitored in the various creeks and streams that are mentioned and shown on Fig. 2.8? This information is needed to more precisely define site baseline conditions prior to the GW ROD in 2003.

p. 17, section 2.2.3. A comment is that Weldon Spring Heights and Missouri Research Park had themselves removed from the National Priority List. WS Heights has a drinking water well (MO 6010919) that has been monitored for gross alpha and gross beta, but only once for uranium, a primary COC for WSS groundwater. Radium-226 and -228 have also been monitored in this well. This GW monitoring program should be mentioned along with the results and trending. I have several questions pending with the office of William Price of MDNR. I noted possible, irregular exceedances of MCLs in the WS Heights drinking water well test results he supplied to me. This type of analysis of the data should have been done long ago, and should not have to be initiated by a citizen stakeholder. It should not take so long to have straightforward questions answered about years-old data. The questions I asked of Mr. Price should have been answered as part of the regular ongoing MDNR monitoring efforts.

p. 18, section 2.2.3. The last sentence of this section mentions that "Two residencies are located on the MDC property north of the Chemical Plant." This is not very precise. Are the residencies located near Burgermeister Spring or it's runoff, for example? Has

the groundwater been tested (applicable to next section 2.2.4 "Groundwater use") in the two residence wells for site COC's and what were the results?

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p. 18, section 2.2.4. **Groundwater Use.**

a) I believe the statement that the Missouri Research Park well is located "cross gradient of the site and therefore does not have the potential for impact" is probably an overstatement of the facts. Add an explanation supporting this concept. Prudence would dictate this well should be tested for site COC's as a baseline for the GW ROD, in light of the density of people in the MRP businesses now working at this large and growing industrial research park. Has the MRP well been so tested and what were the results? Summarize them in this section.

b) Figure 2.8 on page 16 shows two half solid and half dotted lines that contain perennial and wet weather springs and creeks that run parallel to SED. Are these two water systems impacted by Chemical Plant COCs in a similar way to the SED? They should be mentioned and discussed in terms of GW testing results. If they have a spring name or a spring number these data should be included in the Figure 2.8 map on p.16.

c) **A detail map of SED showing radioactive "hot spots" and exact spring locations** should also be added. The one I was pointed to by MDNR is insufficiently detailed to identify either the "hot spots" or the outfalls of spring 5304 within SED.

d) I have sent two letters to DHSS (Gale Carlson) requesting the complete off-site private well water test data related to the Weldon Spring Site. To date, I have received only the electronic data between 1998 and 2002 and have been promised, but not yet received, the earlier water well test data that is on paper forms. I believe it would be desirable to include in the Appendix letters from both MDNR and DHSS regarding the private well test data they have accumulated. I was told, for example, that DHSS/MDOH sends it's reports only to its clients, primarily MDNR, but also (presumably) to U.S. DOE for the Weldon Spring Site. These DHSS reports, which I have asked for from both DHSS and MDNR but not yet received, should be added to the list of references so stakeholders may know about and potentially be able to access them. These reports will also be important for future incorporation into the final long-term stewardship plan and the GW ROD.

e) Add the rationale for why DHSS during 2003 will be testing several wells within a 6 mile radius of the Chemical Plant? This is mentioned in the second sentence on page 19. Again, rather than citing an e-mail from DHSS about its private well testing program (Basko 2003), it would be far better to place this information in an Appendix directly as DHSS generated it. I have expressed concerns about including this Basko 2003 May

22; 2003 e-mail reference in one of my oral remarks that I was not allowed to present at the 8/13/03 public comment meeting. I was cut off after making only four of my 11 points. A typed version of my full oral remarks, with several "blue card" questions, were turned in to Wendy Drnec at the conclusion of the 8/13/03 meeting.

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p. 19, section 2.2.5 Summary of Risk. The statement that "... both carcinogenic and noncarcinogenic effects were evaluated" needs to be clarified. Specifically, state what noncarcinogenic effects (e.g. known late effects of radiation including nephritis, pulmonary fibrosis, liver damage, cognitive impairment) were evaluated and how.

- I have appended a section, "Pumping wells 1991" data, based on DOE supplied well water test data, to emphasize two main points in commenting on section 2.2.5:

[1] The public drinking water wells PW02 through PW-09 in the St. Charles well field have experienced exceedances of EPA MCLs for drinking water as can be seen in my Tables 1 and 2. Specifically, the gross alpha MCL of 15 pCi/L was exceeded in PW-08 at **21.1** pCi/L on 12/16/96, in PW-05 at **19.2** pCi/L on 11/13/91, and in PW-03 at **38.0** pCi/L also on 11/13/91. All wells except PW-05 exceeded site background of 0.93 pCi/L uranium at their peaks and in many interval testings (column 6, Table 1). This is the real data (as opposed to citing the EPA MCL of 20 pCi/L for drinking water which is a trade-off between science and economics) that is relevant to human health and the environment. Clear exceedances in gross beta of the 15 pCi/L MCL (Table 2) occurred in PW-08 at **20.6** pCi/L on 12/20/2000, in PW-07 at **16.2** pCi/L on 12/17/1998, and at **130** and **56.3** (two samples) pCi/L obtained from PW-03 on 12/28/1995.

[2] These data indicate to me that Chemical Plant or Quarry COCs have impacted the well field. Several references I have included show that similar chronic exposures to uranium in drinking water lead to various types of kidney damage. This was found in AEC/Mallinckrodt uranium workers at the site (see Dupree-Ellis 2000, REF 4, part 1) and is supported by medical monitoring test results from residents living near the Fernald Ohio atomic weapons plant (REF8, part 1).

- My oral comments further emphasize why I believe the basic risk assumptions used are flawed. Primarily this is because the inaccurate simplifying assumptions are made that people's baseline EPA Health Index is 0, and that cancer is caused by only a single carcinogenic stimulus. In fact, in a mixed hazardous risk environment such as Weldon Spring Site, the "receptors" (people, animals and fish) have been chronically exposed for decades to multiple chemical and radioactive contaminants that may combine to act synergistically or additively. It is now well known that almost all of us have at least some pesticides, PCBs and uranium in our bodies. Thus all of our baseline risks are well above zero. Because no human testing has been done to residents living around the Weldon Spring Site to my knowledge, data on possible earlier impacts on human health, or elevated total body burdens of any of the identified COCs, are simply unavailable. This differs from the situation, for example, at Paducah KY and the Fernald, Ohio site, where extensive medical monitoring has been carried out.

• MDC and MDNR advocate more fish assays for COCs which I support. However, monitoring nearby residents and vicinity property users is much more important!

p. 21, section 2.2.6. No ARARS or MCLs adopted for gross alpha and gross beta have been included in this section. Yet these are the primary testing parameters used to detect possible radiologic cotamination of vicinity property springs, drainages and private and public (Weldon Spring Heights) and industry (Missouri Research park) wells. This omission should be remedied by stating gross alpha and beta MCLs.

pp. 23-50, section 3. Reevaluation of Technologies and Identification of Final Alternatives.

a) p. 29, section 3.1.2. My general comment is that active remediation efforts were not intensive enough, were too brief in the pilot phases to truly evaluate the technologies, or broad enough in scope, to justify the conclusion by DOE, MDNR and EPA that active remediation strategies for Weldon Spring groundwater are not feasible and would not lessen the 100 time frame to meet ARARS that Alternative 3 of the PP offers. See sentence ending "... would not reduce the remediation time frames for TCE, nitrates, uranium, or nitroaromatic compounds." I strongly disagree.

b) The complete written versions of my oral remarks at the 8/13/03 meeting describe in more detail my specific objections to the Interceptor Trench efforts to remove groundwater uranium near the Quarry site.

c) As I stated earlier, it remains unclear whether this GWOU PP addresses Quarry related GW, and if not, why not and where was that covered in a proposed plan? Presumably the final GW ROD will cover contaminated GW related to the Chemical Plant, Quarry and vicinity properties. I have heard the Army will issue a separate GW ROD. Somewhere in this PP, the relationships between the various PPs and RODs related to both the Army and DOE CERCLA sites (WSSRAP, WSOW) that comprise "the site" should be clarified including dates issued and targeted to be issued. For example, I believe the original timeline for issuing the final GW ROD was Spring 2003.

d) It should be noted that opposition several years ago by MDNR and citizen and other stakeholders to EPA about DOE leaving GW in place (which they felt was tantamount to walking away from the site with respect to GW remediation), as DOE proposed doing, led to the interceptor trench pilot and TCE neutralization by permanganate oxidation. These were not efforts initiated by U.S. DOE of its own volition.

e) This background makes me believe that **cost containment economics** is a major factor whereby Alternative 3 of the GWOU PP is preferred by DOE, MDNR and EPA. My question about this possibility was not answered at the 8/13/2003 meeting, even

though this was promised as my oral presentation was cutoff. Why did this happen? I believe the answer is because the three agencies did not wish to be accountable for providing this information in a public forum with news media present. The question

still stands, and I expect a direct comprehensive answer to it soon. Certainly I expect a answer well before the final GW ROD is opened for public comment.

pp 51-62, section 4. Analysis of Final Alternatives

A general comment is that I strongly support MDNR's critique of 5/13/2003 regarding this PP and the "three final alternatives" mentioned on page 31. In doing so, I add and emphasize that the general public, including stakeholders such as myself, had no opportunity before the Proposed Plan and its Supporting Evaluation before August 2003. My comments submitted 9/3/03 and my 8/13/03 comments addressed at the sol public meeting are my input. It is obvious that MDNR had access to the PP/Supporting Evaluation reports well before even May 13, 2003 in order for them to prepare their detailed comments. The period for the general public to consider the PP/SE was thus too short and too late in the process of selection of alternatives. Had I been allowed to participate, I certainly would have argued strongly, as I do now, that a **fourth alternative, active remediation using all available technologies, be preferred ove Alternative 3**. Not having active remediation as a fourth option to consider is not acceptable and this omission needs to be remedied in the final GWOU ROD.

p. 58, section 4.3.2.

a) The statement that "*Alternative 3 would provide adequate protection of human health and the environment*" is challenged [1] because Alternative 3 of the PP include institutional controls that may include signage to educate and inform, as well as warn, the public. However, DOE, MDNR and MDOC, judged by their actions and words over many years, are totally opposed to posting any warning signs at the Katy Trail monitor well field south of the remediated Quarry, on the uranium-contaminated north bank of Femme Osage Slough, at the Quarry itself, along the Femme Osage Creek, at the Ka Trail crossing of the SED, within SED, or at spring 6301 (Burgermeister). This, in my view callous attitude on the part of all three agencies with respect to protecting the public has prevailed during the remediation period of 1987-2000 when ground and surface water uranium levels at these sites were much higher than present, still elevated levels. I strongly reject federal, state and county agency rationales that [1] th 6301 spring water is safe to drink; [2] there are no exposure pathways (there are: swimming, drinking); [3] the public "has a short attention span" and "would be scared unnecessarily." My input from the general public is that these are self-serving excuse not facts. The public's Right to Know is overriding here and should no longer be ignored.

b) The statement that "*The natural attenuation processes of dilution and dispersion are expected to attenuate contaminant concentrations to levels that would allow use of the groundwater for unlimited use and unrestricted exposure (i.e., to ARARS)*" needs to be expanded upon, and clarified, to include trending evidence that shows an

extrapolation to below ARAR levels in 100 years, the projected time frame for Alternative 3 of the PP. Data from springs 6301 and 5304 should be used for this analysis. The analysis should describe specifically how processes such as dispersion and dilution can lead to attenuation for uranium with its 4.47 billion year half-life. What would cause the uranium to disperse, if as claimed by DOE, the uranium is not now moving and is firmly absorbed to soil? How can dispersion be operative for uranium, for example, when the leading edge of the plume is stated to be fixed in place, not moving, because of the "natural" oxidation/reduction zone at the north bank of Femme Osage Slough? This reasoning defies scientific logic.

c) The statement "It is expected that the attenuation would occur **[within a reasonable time frame]**" should be modified replacing the bracketed text with "within 100 years", which is the actual time frame projected for Alternative 3 to achieve its goals. The phrase "Reasonable time frame" is too indefinite to have any useful meaning. What is reasonable to EPA, DOE and MDNR at WSS is obviously not reasonable to USGS who is remediating TCE at Fort Lewis Washington in a projected 40 year time frame using complementary active technologies, which seems more "reasonable" to me.

d) The final paragraph "MDNR has expressed support for this alternative because it provides for contingencies..." is somewhat misleading because a key objection is the nature of the contingencies and triggers, as expressed by Mimi Garstang of MDNR at the 8/13/03 public meeting. A letter from MDNR expressing their support for Alternative 3 contingencies should be included as an Appendix document to indicate that, indeed, "... MDNR has expressed its support" as the present August 2003 GWOU PP draft maintains is the case. The MDNR qualifiers and concerns need to be stated.

pp 63-92, section 5. Preliminary Design for the Preferred Alternative

p. 63, section 5.1 Institutional Controls.

a) This section addresses as ICs land use "insruments or mechanisms" but nothing about signage—not a word. I assert again this flagrantly, irresponsibly and wantonly negates and ignores **THE PUBLIC RIGHT TO KNOW**. I offer as evidence that the public is not the only stakeholder who believes this major oversight needs to be addressed. MDNR in at least three of their quarterly WSSRAP environmental oversight reports to DOE (which funds their activities on site) has included a photograph of the SED crossing the Katy Trail. The caption and accompanying text point to the need for signage at this location. Yet everyone involved, including MDNR, MDOC and DOE have

ignored this agency request. I believe that refusal to use educatoinal, warning signage about the presence of specific elevated COCs (by name) such as uranium, nitrates, and nitroaromatics is a self-serving one rather than being truly done to avoid "scaring" the public with "it's short attention span." The agencies well know that fewer people might bring their children or fish at the Conservation areas, or visit the cell or

Katy Trail, if the full truth were disclosed. Nevertheless, that is exactly what needs to happen.

b) A segment of the general public, including me, strongly objects to being characterized in this demeaning and inaccurate manner as prone to be scared by the facts and having a short attention span which are both patently untrue. ICs should include warning signs!

c) I offer the references and DOE test data in my section on "Pumping Wells 1991 data" as support for my belief as a licensed physician and human pathologist on the faculty of a leading U.S. medical school, that the public is at significant risk by using the Katy Trail, the SED, fishing in the Femme Osage Slough, having unfettered access for decades to Burgermeister spring 6301 in the heart of the August A. Busch Memorial Conservation Area and to the unnamed creeks and springs and Lakes shown (but not labeled in many cases) on page 16, in the Figure 2.8 map.

pp 93-94. Section 6. References

I voice my strong objections to reference 2 (Basko R., 2003) and the last one listed (Vogel J 2003) which are to e-mails that public stakeholders have no ready access to. The body of both 5/22/03 and 4/3/03 e-mails should be included as an Appendix to the PP/SE. I did obtain the 5/22/03 Basko to Cato e-mail under a Missouri Sunshine Law request (from Rose Basko of DHSS) and have commented on its contents in my written version of my 8/13/03 oral comments on the Proposed Plan. I will make a similar Sunshine/FOIA request to obtain the April 3, 2003 e-mail from John Vogel of MDOC and Pamela Thompson, project manager at WSSRAP. Also, the content of these e-mails should become part of the WSS administrative record and the EPA Superfund records at Kansas City as part of site documentation. Stakeholders have a right to see this information and should not have to do cartwheels to get it.

Respectfully Submitted (e-mail with Faxed and Mailed hard copies),

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

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

September 3 (Wednesday), 2003

"PUMPING WELLS 1991" DATA
St Charles County, Missouri, public drinking water well field
DOE data supplied to DWM 6/13/2001

Table 1. Highest concentration and ranges of gross alpha and uranium in the nine "PW" wells 1991-2001 (294 of 7744 total samples for gross alpha and 304 of 7744 total samples for total uranium)

Well Number	Highest Conc. Date[1]	Gross Alpha	Concentr. Range[1]	Highest Conc. Date	Total Uranium[2]	Concentr. Range[1]
PW-09	12/9/93	**5.3**	1.75 - 5.3	9/22/98	**5.60**	.18 - 5.60
PW-08	12/16/96	**21.1**	1.1 - 21.1	9/22/98	**2.11**	.125 - 2.11
PW-07	2/24/93	**9.2**	1.5 - 9.2	9/22/98	**4.08**	.129 - 4.08
PW-06	12/17/98	**7.81**	1.53 - 7.81	8/31/94	**1.38**	.144 - 1.38
PW-05	11/13/91	**19.2**	1.0 - 19.2	3/21/96	**.738**	.0706 - .738
PW-04	2/24/93	**4.9**	1.41 - 4.9	9/22/98	**1.19**	.042 - 1.19
PW-03	11/13/91	**38.0**	1.0 - 38.0	2/15/95	**6.64**	.047 - 6.64
PW-02	3/24/98	**3.91**	1.30 - 3.91	9/22/98	**6.82**	.0768 - 6.82
All 2-9	11/13/91	**38.0**	1.0 - 38.0	9/22/98	**6.82**	.047 - 6.82

[1] Note all concentrations are expressed as pCi/L
[2] Note the DOE Weldon Spring total uranium background is 0.93 pCi/L

Point: Mike Duvall, head of St. Charles county Environmental Services, stated in several open public meetings during 2001, 2002 that he would stake his professional career and say unequivocally that no elevations of radioactivity have ever been detected in the St. Charles county well field—the water is safe to drink.

Rebuttal: The data in Table 1 contradicts Mr. Duvall's repeated assertions, that have been echoed by U.S. DOE-WSSRAP personnel, in at least three ways:

- **First**, peak all-time uranium levels in all wells except PW05 exceed DOE's site background of 0.93 pCi/L for total uranium.
- **Second**, total uranium and gross alpha measurements, which DOE and Mr. Duvall (among other officials) state represent "background" levels, implying "natural" background levels, obviously fluctuate widely as shown in the concentration range columns 4 and 7 of Table 1 and Table 2 on page 2 of this document.
- **Third**, the peak levels of 21.1 pCi/L and 38.0 pCi/L in PW-08 and -03 in December 1996 and November 1991 are high by any standards and cannot be viewed as "natural" or "natural background". The data challenge that view and make it untenable.

Daniel W. McKeel, Jr., M.D.'s conclusions from the DOE data: Gross alpha and total uranium elevations above natural background have been exceeded on several dates spanning 1991 through 2001. The fact that total uranium levels peaked in four St. Charles public drinking water wells simultaneously on September 22, 1998 rather suggests that some discrete contaminating event occurred preceding, or on that date, to elevate both measures of radioactivity above baseline. Unless proof by DOE or St. Charles county can be produced that this event was natural and unrelated

to actiivties at the Weldon Spring Site Remedial Action Project (WSSRAP), either at the Chemical Plant or Quarry remediation sites, one must conclude the gross alpha and total uranium elevations were in fact related to WSSRAP activities, and thereby did further contaminate the public drinking water supply of St. Charles county.

Table 2. Highest concentration and ranges of gross alpha compared with gross beta in the nine "PW" wells 1991-2001 (295 of 7744 total samples for gross alpha and 263 of 7744 total samples for gross beta)

Well Number	Highest Conc. Date[1]	GROSS ALPHA	Concentr. Range	Highest Conc. Date	GROSS BETA	Concentr. Range
PW-09	12/9/1993	**5.3**	1.75 - 5.3	11/29/1994	**10.3**	3.40 - 10.3
PW-08	12/16/1996	**21.1**	1.1 - 21.1	12/20/2000	**20.6**	1.46 - 20.6
PW-07	2/24/1993	**9.2**	1.5 - 9.2	12/17/1998	**16.2**	4.06 - 16.2
PW-06	12/17/1998	**7.81**	1.53 - 7.81	9/28/1995	**9.3**	3.72 - 9.3
PW-05	11/13/1991	**19.2**	1.0 - 19.2	12/9/1993	**10**	2.95 - 10
PW-04	2/24/1993	**4.9**	1.41 - 4.9	12/16/1996	**9.62**	3.9 - 9.62
PW-03	11/13/1991	**38.0**	1.0 - 38.0	9/28/1995 9/28/1995	**130** **56.3**	130 56.3
PW-02	3/24/1998	**3.91**	1.30 - 3.91	12/19/1996	**10.2**	4.13 - 10.2
All 2-9	11/13/1991	**38.0**	1.0 - 38.0	12/19/1996	**130**	1.46 - 130

[1] Note all concentrations are expressed as pCi/L

The same comments made about results in Table 1 also apply to those in Table 2. Here, however, unequivocal elevations of gross beta occurred on September 28, 1995. That this result was considered signifcant is the fact that two PW03 well samples were obtained that day instead of the usual single sample per well. One wonders how the sampler knew to take two samples that day, unless it was known that WSSRAP activities had impacted groundwarer to a greater degree than usual.
The gross beta levels again challenge the validity of Mr. Duvall's and DOE's repeated statements that DOE activities have never impacted the St. Charles county well field.

Note also that PW-03 has the highest gross alpha reading of all wells, suggesting that the topographic location of wells in the well field has a bearing on whether or not they experience higher radioactivity levels as a function of WSSRAP-related activities. Similarly, PW-08 has the second overall highest elevations of gross alpha and beta.

Mr. Duvall's statements that well field wells had never had "elevations" could be construed only in the very narrowest sense that EPA MCL's had not been exceeded. While this may be true for total uranium (MCL limit 30 pCi/L or 20 pCi/L when adjusted for WSS uranium isotope mix), gross alpha and beta MCLs of 15 pCi/Ls (or lower) have been clearly exceeded in several wells over a long time span, further refuting "no elevation ever" claims based on MCLs. Gross alpha and beta MCLs and relevant ARARS should be given in the GWOU Proposed Plan as stated elsewhere.

I would argue that chronic elevations of uranium in drinking water at WSS has already exposed the St. Charles county residents to significant adverse health risks both from chemical toxicity (developing nephritis) and radioactivity (developing renal cell [kidney] cancer) as shown by the attached references.

This data analysis will be sent to DOE (Pam Thompson in 9/3/03 GW PP comments), St. Charles county (Joe Ortwerth, Mike Duvall), MDNR (Bob Geller, Mimi Garstang, Larry Erickson), EPA (Dan Wall) and WSCC (Helene Diller to be distributed to all commissioners).

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

Daniel W. McKeel, Jr., M.D. 9/03/2003

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Enclosure:
- References to uranium chemical and radioactivity toxicity

REFERENCES TO URANIUM TOXICITY

[1]
Kurttio P. Auvinen A. Salonen L. Saha H. Pekkanen J. Makelainen I. Vaisanen SB. Penttila IM. Komulainen H.
Institution
STUK-Radiation and Nuclear Safety Authority, Research and Environmental Surveillance, Helsinki, Finland. paivi.kurttio@stuk.fi
Title
Renal effects of **uranium** in drinking water.
Source
Environmental Health Perspectives. 110(4):337-42, 2002 Apr.
Local Messages
Title held by Becker Library.
Abstract
Animal studies and small studies in humans have shown that **uranium** is nephrotoxic. However, more information about its **renal** effects in humans following chronic exposure through drinking water is required. We measured **uranium** concentrations in drinking water and urine in 325 persons who had used drilled wells for drinking water. We measured urine and serum concentrations of calcium, phosphate, glucose, albumin, creatinine, and beta-2-microglobulin to evaluate possible **renal** effects. The median **uranium** concentration in drinking water was 28 microg/L (interquartile range 6-135, max. 1,920 microg/L) and in urine 13 ng/mmol creatinine (2-75), resulting in the median daily **uranium** intake of 39 microg (7-224). **Uranium** concentration in urine was statistically significantly associated with increased fractional excretion of calcium and phosphate. Increase of **uranium** in urine by 1 microg/mmol creatinine increased fractional excretion of calcium by 1.5% [95% confidence interval (CI), 0.6-2.3], phosphate by 13% (1.4-25), and glucose excretion by 0.7 micromol/min (-0.4-1.8). **Uranium** concentrations in drinking water and daily intake of **uranium** were statistically significantly associated with calcium fractional excretion, but not with phosphate or glucose excretion. **Uranium** exposure was not associated with creatinine clearance or urinary albumin, which reflect glomerular function. In conclusion, **uranium** exposure is weakly associated with altered proximal tubulus function without a clear threshold, which suggests that even low **uranium** concentrations in drinking water can cause nephrotoxic effects. Despite chronic intake of water with high **uranium** concentration, we observed no effect on glomerular function. The clinical and public health relevance of the findings are not easily established, but our results suggest that the safe concentration of **uranium** in drinking water may be within the range of the proposed guideline values of 2-30 microg/L.

[2]
Hakonson-Hayes AC. Fresquez PR. Whicker FW.
Institution
Environment, Safety, and Health Division, Los Alamos National Laboratory, NM 87545, USA.
Title
Assessing potential risks from exposure to natural **uranium** in well water.
Source
Journal of Environmental Radioactivity. 59(1):29-40, 2002.
Abstract
Over 50% of the wells in the Nambe region of northern New Mexico exceed the US Environmental Protection Agency's recommended drinking water standard of 20 microg l(-1) for 238U; the highest in the area was measured at 1,200 microg U l(-1). **Uranium** uptake was estimated in tomato (Lycopersicon esculentum), squash (Cucurbita pepo), lettuce (Lactuca scarriola), and radish (Raphanus sativus) irrigated with Nambe well water containing <1, 150, 500, and 1,200 microg U l(-1). Plant uptake and human dose and toxicity associated with ingestion of water and produce and inhalation of irrigated soil related to gardening activities were evaluated. **Uranium** concentration in plants increased linearly with increasing U concentration in irrigation water, particularly in lettuce and radish. The estimated total committed effective dose for 70 years of maximum continuous exposure, via the three pathways to well water containing 1,200 microg U l(-1), was 0.17 mSv with a corresponding **kidney** concentration of 0.8 microg U g(-1) **kidney**.

[3]
Sanchez DJ. Belles M. Albina ML. Sirvent JJ. Domingo JL.
Institution
Laboratory of Toxicology and Environmental Health, School of Medicine, Rovira i Virgili University, Reus, Spain.
Title
Nephrotoxicity of simultaneous exposure to mercury and **uranium** in comparison to individual effects of these metals in rats.
Source
Biological Trace Element Research. 84(1-3):139-54, 2001 Winter.
Local Messages
Title held by Becker Library; print canceled.
Abstract
Both inorganic mercury and **uranium** are known nephrotoxicants in mammals. In this study, the **renal** toxicity of a concurrent exposure to inorganic mercury and **uranium** was compared with the nephrotoxic effects of the individual metals in a rat model. Eight groups of rats, 10 animals per group, were subcutaneously given a single administration of mercuric chloride (HgCl2, 0.34 mg/kg and 0.68 mg/kg), uranyl acetate

dihydrate (UAD, 2.5 mg/kg and 5 mg/kg), or combinations of both compounds at the same doses. A ninth group of rats received sc injections of 0.9% saline and

was designated as the control group. Necrosis of proximal tubules, which was observed in all experimental groups, was the most relevant morphologic abnormality. Marked changes, which were remarkably greater than those induced by the individual elements, were noted in some urinary parameters in the groups concurrently exposed to HgCl2 and UAD. It could be an indicator of a synergistic interaction between mercury and **uranium**. In contrast, compared with the urinary levels found after individual administration of the highest doses of mercury and **uranium**, significant reductions in the urinary concentrations of these elements were noted following simultaneous exposure to both metals. At these doses, the reduction in the urinary metal excretion was also accompanied by significant decreases in the **renal** content of mercury and **uranium**. Whereas the results of some parameters pointed out a possible synergistic interaction between mercury and **uranium**, other measures hinted that an antagonistic interaction between these elements is also present.

[4]
Dupree-Ellis E. Watkins J. Ingle JN. Phillips J.
Institution
Center for Epidemiologic Research, Oak Ridge Associated Universities, TN 37830-0117, USA.
Title
External radiation exposure and mortality in a cohort of **uranium** processing workers.
Source
American Journal of Epidemiology. 152(1):91-5, 2000 Jul 1.
Local Messages
Title held by Becker Library.
Abstract
In a study of 2,514 White male workers employed between 1942 and 1966 at a US **uranium** processing plant, mortality was compared with overall US mortality, and the relation between external ionizing radiation and cancer was evaluated. Through 1993, 1,013 deaths occurred. The mean cumulative dose was 47.8 mSv. The standardized mortality ratio (SMR) was 0.90 for all causes of death and 1.05 for all cancers. Many cancer sites had elevated SMRs. Among nonmalignant outcomes, the SMR for chronic nephritis was 1.88 (six deaths observed). An excess relative risk estimate of 10.5 per Sv (10 cases) was observed for **kidney** cancer; this may have resulted from chance, internal radiation, or chemical exposures not considered.

[5]
Ritz B.
Institution
Department of Epidemiology, School of Public Health, University of California, Los Angeles 90095-1772, USA.

Title
Cancer mortality among workers exposed to chemicals during **uranium** processing.
Source
Page 7

Journal of Occupational & Environmental Medicine. 41(7):556-66, 1999 Jul.
Local Messages
Title held by Becker Library.
Abstract
Data provided by the Comprehensive Epidemiology Data Resource allowed us to study patterns of cancer mortality as experienced by 3814 **uranium**-processing workers employed at the Fernald Feed Materials Production Center in Fernald, Ohio. Using risk-set analyses for cohorts, we estimated the effects of exposure to trichloroethylene, cutting fluids, and kerosene on cancer mortality. Our results suggest that workers who were exposed to trichloroethylene experienced an increase in mortality from cancers of the liver. Cutting-fluid exposure was found to be strongly associated with laryngeal cancers and, furthermore, with brain, hemato- and lymphopoietic system, bladder, and **kidney** cancer mortality. Kerosene exposure increased the rate of death from several digestive-tract cancers (esophageal, stomach, pancreatic, colon, and rectal cancers) and from prostate cancer. Effect estimates for these cancers increased with duration and level of exposure and were stronger when exposure was lagged.

[6]
Zamora ML. Tracy BL. Zielinski JM. Meyerhof DP. Moss MA.
Institution
Radiation Protection Bureau, Department of Health, Ottawa, Ontario, Canada.
Title
Chronic ingestion of **uranium** in drinking water: a study of **kidney** bioeffects in humans.
Source
Toxicological Sciences. 43(1):68-77, 1998 May.
Abstract
A study was conducted of the chemical effects on the human **kidney** induced by the chronic ingestion of **uranium** in drinking water. Subjects were divided into two groups: The low-exposure group, whose drinking water was obtained from a municipal water system and contained < 1 microgram **uranium**/L, and the high-exposure group, whose drinking water was obtained from private drilled wells and contained **uranium** levels that varied from 2 to 781 micrograms/L. Years of residence varied from 1 to 33 years in the low-exposure group and from 3 to 59 years in the high-exposure group. The indicators of **kidney** function measured in this study included glucose, creatinine, protein, and beta 2-microglobulin (BMG). The markers for cell toxicity studied were alkaline phosphatase (ALP), gamma-glutamyl transferase (GGT), lactate dehydrogenase (LDH), and N-acetyl-beta-D-glucosaminidase (NAG). Urinary glucose was found to be significantly different and positively correlated with **uranium** intake for males, females, and pooled data. Increases in ALP and BMG were also observed to be correlated with **uranium** intake for pooled data. In contrast, the indicators for glomerular

injury, creatinine and protein, were not significantly different between the two groups nor was their urinary excretion correlated to **uranium** intake. These results

suggest that at the intakes observed in this study (0.004 microgram/kg to 9 micrograms/kg body wt), the chronic ingestion of **uranium** in drinking water affects **kidney** function and that the proximal tubule, rather than the glomerulus, is the site for this interference.

[7]
Taylor DM. Taylor SK.
Institution
University of Heidelberg, Institute of Pharmacology and Toxicology, Germany.
Title
Environmental **uranium** and human health. [Review] [69 refs]
Source
Reviews on Environmental Health. 12(3):147-57, 1997 Jul-Sep.
Abstract
Uranium from the environment enters the human body by ingestion with food and drink and by inhalation of respirable airborne **uranium**-containing dust particles or aerosols. Daily intake of **uranium** in food and water varies from approximately 1 to approximately 5 micrograms U/d daily in uncontaminated regions to 13-18 micrograms/d or more in **uranium** mining areas. A 70 kg, non-occupationally exposed 'Reference Man' living in Europe or in the United States has an estimated total body **uranium** content of about 22 micrograms. **Uranium** is absorbed from the intestine or the lungs, enters the bloodstream, and is rapidly deposited in the tissues, predominantly **kidney** and bone, or excreted in the urine. In the bloodstream, **uranium** is associated with red cells, and its clearance is relatively rapid. **Renal** toxicity is a major adverse effect of **uranium**, but the metal has toxic effects on the cardiovascular system, liver, muscle, and nervous system as well. Any possible direct risk of cancer or other chemical- or radiation-induced health detriments from **uranium** deposited in the human body is probably less than 0.005% in contrast to an expected indirect risk of 0.2% to 3% through inhaling the radioactive inert gas radon, which is produced by the decay of environmental **uranium**-238 in rocks and soil and is present in materials that are used to build dwellings and buildings where people live and work. [References: 69]

[8]
Authors
Pinney SM. Freyberg RW. Levine GE. Brannen DE. Mark LS. Nasuta JM. Tebbe CD. Buckholz JM. Wones R.
Institution
Department of Environmental Health, University of Cincinnati College of Medicine, Cincinnati, Ohio 45267-0056, USA. susan.pinney@uc.edu
Title
Health effects in community residents near a **uranium** plant at Fernald, Ohio, USA.

Source

International Journal of Occupational Medicine & Environmental Health. 16(2):139-53, 2003.

Abstract

OBJECTIVES: Health outcomes in persons who lived in the area surrounding a U.S. Department of Energy (DOE) **uranium** processing plant near Fernald, Ohio were evaluated using data of Fernald Medical Monitoring Program (FMMP) participants. **METHODS:** Residential history information was used to identify participants who lived in close proximity to the plant (less than 2 miles), in the direction of groundwater runoff (south of the plant), or used a well or cistern as a drinking water source. Standardized prevalence ratios (SPRs) for certain disease endpoints were calculated using the U.S. National Health Interview Survey(NHIS) and the National Health and Nutrition Examination Survey (NHANES) data files for comparison rates. **RESULTS:** Findings suggest that prior living within the Fernald exposure domain is related to increased prevalence of urinary system disease. Statistically significant elevations of bladder disease (standardized prevalence ratio or SPR = 1.32) and kidney disease (SPR = 2.15), including sub-categories, kidney stones (SPR = 3.98) and chronic nephritis (SPR = 2.03) were noted, as well as increased rates for hematuria and urethral stricture. In regression analyses with adjustment forage and sex, serum creatinine levels were increased in those who had lived close to the plant. Increased white blood cell count and hemoglobin levels, and decreased mean corpuscular volume were also found in those living less than 2 miles from the plant. Those who used a well or cistern for drinking water were found to have increased urinary microalbumin, red blood cell count and hematocrit. **CONCLUSIONS:** These preliminary findings will provide the basis for future hypothesis testing incorporating important determinants of exposure not included in this study, such as duration and calendar year of exposure, location relevant to prevailing wind direction, and age at exposure.