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Responsiveness Summary for the Engineering Evaluation/Cost Analysis for the Proposed Management of Contaminated Water Impounded at the Weldon Spring Chemical Plant Area

January 1991

U.S. Department of Energy
Oak Ridge Operations Office
Weldon Spring Site Remedial Action Project

DOE/OR/21548-144

Responsiveness Summary for the Engineering Evaluation/Cost Analysis for the Proposed Management of Contaminated Water Impounded at the Weldon Spring Chemical Plant Area

January 1991

prepared by

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NOTATION

The following is a list of the acronyms, initialisms, and abbreviations (including units of measure) used in this document.

ACRONYMS, INITIALISMS, AND ABBREVIATIONS

ALARA	as low as reasonably achievable
BEIR	Committee on the Biological Effects of Ionizing Radiations
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended
CLP	Contract Laboratory Program
DOE	U.S. Department of Energy
DNA	deoxyribonucleic acid
DNR	(Missouri) Department of Natural Resources
EE/CA	engineering evaluation/cost analysis
EIS	environmental impact statement
EPA	U.S. Environmental Protection Agency
NEPA	National Environmental Policy Act of 1969, as amended
NPDES	National Pollutant Discharge Elimination System
NRC	U.S. Nuclear Regulatory Commission
RCRA	Resource Conservation and Recovery Act of 1976, as amended
RI/FS	remedial investigation/feasibility study

UNITS OF MEASURE

d	day(s)
ft	foot (feet)
g	gram(s)
gpm	gallon(s) per minute
L	liter(s)
m^3	cubic meter(s)
mrem	millirem(s)
pCi	picocurie(s)
rad	radiation absorbed dose
rem	roentgen equivalent man
yd^3	cubic yard(s)
yr	year(s)

1 INTRODUCTION

The U.S. Department of Energy (DOE) issued the *Engineering Evaluation/Cost Analysis for the Proposed Management of Contaminated Water Impounded at the Weldon Spring Chemical Plant Area* (DOE/OR/21548-106) in July 1990. The engineering evaluation/cost analysis (EE/CA) examines various alternatives for the proposed action to manage contaminated surface water impounded at the chemical plant area. The primary objective is to minimize potential migration of contaminants from surface impoundments to the local environment. The EE/CA addresses water currently impounded in four waste raffinate pits and two small ponds and water that will be impounded in the future as a result of upcoming response actions. Radioactive and chemical contaminants are migrating from the currently impounded water to underlying on-site groundwater via seepage and to off-site surface water via runoff. The treatment process and facilities that will be provided for management of currently impounded water can subsequently be used to manage other contaminated water in the future.

The EE/CA documentation for the proposed removal action is consistent with requirements of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended, and the National Oil and Hazardous Substances Pollution Contingency Plan. In addition, the EE/CA was prepared in accordance with U.S. Environmental Protection Agency (EPA) guidance for CERCLA removal actions.

Based on the evaluation of various alternatives in the EE/CA, DOE determined that the best approach for managing surface water impounded at the chemical plant area would be to remove contaminants from the water and release the treated water to the Missouri River via a natural drainage channel. To establish requirements for releasing this treated water, DOE applied for a modification to its existing discharge permit from the Missouri Department of Natural Resources (DNR) under the National Pollutant Discharge Elimination System (NPDES) program. The EE/CA provided a major source of technical input to the application for modifying the permit.

The EE/CA document was issued to the public on July 25, 1990. Prior to issuance, DOE held several meetings with local officials, school administrators, special interest groups, and members of the general public to receive input on the proposed action. The public comment period for this action extended from July 25 through August 27, consistent with the public participation process identified in CERCLA. The Missouri DNR issued public notice of the proposed modification to the existing NPDES permit on August 4. The DOE and EPA held a joint public meeting with the Missouri DNR regarding the proposed action and permit modification on August 16 at the Columns Banquet and Conference Center in St. Charles, Missouri. The permit modification was issued to DOE by the Missouri DNR on October 1.

This responsiveness summary has been prepared to address the major issues identified in oral and written comments on the proposed action. Transcripts of the public meeting are included as part of the administrative record. Most of the questions raised by the public at this meeting were responded to during the meeting. The DOE also received three letters regarding the proposed action. Chapter 2 of this document presents general issues that were raised at the

public meeting and in written comments, and Chapter 3 presents copies of the letters received. Responses are provided for both general issues and individual issues (comments) identified in the letters.

2 GENERAL ISSUES AND RESPONSES

Issue 1

Comment. The risks of radiation exposure are not understood well enough to define a safe level of radiation exposure.

Response. The risks of radiation exposure are understood better than those of many other carcinogens. The risks associated with exposure to low levels of radiation are conservatively estimated by extrapolating from risks associated with exposure to much higher levels (see also Response to General Issue 3). For the hypothetical maximally exposed individual, the incremental risk of incurring a fatal cancer as a result of the proposed release of treated water to the Missouri River is less than 1/2,500,000 of the risk due to background radiation.

Issue 2

Comment. No drinking water standard has been established for uranium. The concentration of uranium in the effluent should be reduced to levels as close to zero as possible.

Response. Although a drinking water standard for uranium has not yet been established, EPA is currently considering a range of potential concentrations. Uranium occurs naturally in the environment, and the incremental uranium concentration in the Missouri River that would result from the proposed action would be more than 1,000 times lower than the concentration that is naturally present in the river. Further, this concentration would be more than 3,000 times lower than the lowest end of the concentration range being considered by EPA for a drinking water standard.

The DOE is committed to reducing radioactive releases to the environment to levels that are as low as reasonably achievable (ALARA). Many standard technologies are available for removing radioactive contaminants from water; these technologies were analyzed extensively in the EE/CA to determine the most appropriate combination of proven technologies for the proposed action. Based on this analysis, it was determined that reducing the uranium concentration in the effluent to a level of 100 pCi/L, with a design goal of 30 pCi/L, would be reasonably achievable. This range is much lower than the applicable DOE limit for discharge to surface waters, and the design goal is similar to that being discussed by EPA for a drinking water standard (i.e., the level to be met at the tap following distribution by a water supply system).

Issue 3

Comment. The report recently released by the Committee on the Biological Effects of Ionizing Radiations (i.e., the BEIR V report) indicates that the biological effects of exposure to low levels of radiation are greater than previously estimated. Are any changes in the federal government's drinking water standards likely to result from the BEIR V study? Does this study affect the discharge limits for the proposed action?

Response. It is not clear that the BEIR V study, in and of itself, warrants a reduction of the federal government's drinking water standards. The BEIR V report presents a detailed description of current data on the potential health risk from exposure to low levels of ionizing radiation. This study indicates that the health risk is about three times greater than that estimated in the BEIR III report. However, as noted in the BEIR V study, a number of limitations are associated with the data used to reach these conclusions. Estimates of the carcinogenic risks that may be associated with low doses of radiation were extrapolated from effects observed at doses greater than 10 rem delivered over a short period of time. A dose of 10 rem is greater than annual exposure limits for radiation workers set by both DOE and the U.S. Nuclear Regulatory Commission (NRC), and it is much greater than DOE, NRC, and EPA annual exposure limits for the general public. Health hazards associated with chronic exposure to low levels of ionizing radiation have been studied at a number of locations -- including areas with high levels of background radiation, areas receiving fallout from nuclear weapons testing, and areas near nuclear installations. Results of these studies do not indicate an elevated level of cancer risk. Hence, it is not possible to draw definitive conclusions regarding cancer risks associated with chronic exposure to low levels of ionizing radiation.

A major component of DOE's radiation protection program is the ALARA process. Under this process, releases of radioactivity to the environment and related exposures are reduced to levels that are as low as reasonably achievable. Consistent with this approach, DOE has reduced the residual concentration goals for the proposed action to levels as low as reasonably achievable and significantly below applicable standards. These goals would not be affected even if standards were lowered because the concentrations of residual contaminants in the treated water at points of entry into public water supply systems are far below applicable standards.

Issue 4

Comment. Dilution of the contaminated water in the Missouri River is not an acceptable solution.

Response. Prior to being discharged to the Missouri River, the water impounded at the chemical plant area will be extensively treated to meet federal and state standards and guidelines that are protective of human health and the environment. These treatment standards were developed without consideration of dilution.

Issue 5

Comment. Discharging contaminated water to the Missouri River is not an acceptable solution. The water should be treated and stored in tanks, holding ponds, or evaporation ponds rather than being released to the river.

Response. Contaminants will be removed from the water to produce a high-quality effluent, which will be released to the Missouri River in compliance with stringent discharge limits; these limits are based on protecting human health and the environment. No water will be released from the treatment system unless discharge limits are met. The land available for holding ponds is inadequate for the potential volume of treated water, and evaporation ponds would not be effective because of the balance between precipitation and evaporation in the Weldon Spring area. More important, because of the high quality of the effluent, there is no reason to store the treated water on-site.

Issue 6

Comment. The proposed treatment plant discharge will flow in the Southeast Drainage, which is contaminated as a result of past operations at the site. Will the contamination present in the Southeast Drainage be picked up by the water discharged from the treatment plant?

Response. Residual levels of decay products from the uranium-238 and thorium-232 decay series are present in the soils and sediments of the Southeast Drainage. These contaminants were deposited in the drainage during the operational period of the chemical plant. Levels of contaminants in water flowing in the drainage have stabilized over time and are currently low. The flow in the drainage during batch discharge from the treatment plant will constitute only a fraction of the natural flow that occurs in the drainage during and after precipitation.

To address the issue of potential resuspension, tests are being conducted in the Southeast Drainage in coordination with the Missouri DNR. For these tests, water is released from a fire hydrant at the top of the drainage at a number of flow rates, including the discharge rate planned for the proposed action, and water samples are collected at several locations within the drainage to evaluate the degree to which contaminants are resuspended. Test results will be made available to EPA Region VII, Missouri state agencies, and the public following sample analyses. Based on previous studies, no significant resuspension is expected; however, DOE will reevaluate the discharge plan if the results indicate that significant resuspension could occur. For example, if potential resuspension were identified, the discharge could be piped to a point in the drainage beyond the area of significant impact or it could be piped along the haul road between the chemical plant area and the quarry (as described for Option 4 in Section 6.1 of the EE/CA).

Issue 7

Comment. The treated water should not be discharged to a losing stream.

Response. Tracing studies by the Missouri DNR, Division of Geology and Land Services, indicate that the Southeast Drainage contains four losing stream segments with associated downstream springs; that is, each segment is part of the recharge area for the next spring (see Appendix A of the EE/CA). This indicates that flow in the channel is self-contained, i.e., water lost to the streambed stays within the drainage boundary. Thus, all water discharged at the head of the drainage ultimately flows into the Missouri River at the base of the drainage. Based on current information, use of this natural drainage channel is the most effective and environmentally acceptable means for discharging the treated water to the river.

Issue 8

Comment. What monitoring will be conducted to ensure that the NPDES permit requirements are met?

Response. Treated water will be released from the treatment plant by batch discharge, and DOE will test all water prior to release to ensure compliance with NPDES permit requirements. As part of the NPDES monitoring program, the effluent will also be tested within the Southeast Drainage at its confluence with the Missouri River. The Missouri DNR will independently monitor the treated water to ensure permit compliance. In addition, any interested party could split samples of the treated water for independent analysis. The incremental concentration of uranium in the Missouri River due to discharge of the treated water will be immeasurably small relative to naturally occurring levels. However, DOE will monitor uranium levels at the intake of the first water treatment plant on the Missouri River downstream of the discharge to ensure that the drinking water supply for St. Louis County is not impacted by this action.

Issue 9

Comment. During periods of precipitation, both treatment plant discharge and contaminated surface runoff from the site will flow in the Southeast Drainage. Will this have an additive effect on the river and on related potential health risks beyond the effects associated with the proposed effluent release?

Response. During and after precipitation, flow in the Southeast Drainage will include the effluent discharge, storm-water runoff from the chemical plant area, and surface runoff from other portions of the drainage area for that channel. The last of these will account for most of the flow in the channel. Because uranium is naturally present in the Missouri River and because the flow volume of the river is substantially greater than the contribution from the Southeast Drainage, the incremental impact to the river and related risks will be immeasurable.

Issue 10

Comment. Is any additional monitoring planned for the Missouri River, e.g., of fish?

Response. There are currently no plans to test fish in the Missouri River as part of the proposed action. Water in both the drainage and the river is currently monitored on a quarterly basis as part of the environmental monitoring program for the Weldon Spring site. Under this program, water is monitored at four spring recharge areas in the drainage and at three locations in the river: the Weldon Spring boat launch, a location between the quarry water treatment plant discharge and the Southeast Drainage, and a location downstream of the Southeast Drainage. As part of the NPDES monitoring program for this action, water will also be sampled in the drainage at its confluence with the Missouri River. As part of the NPDES monitoring program for the similar quarry action, water will be tested at an additional downstream location on the river, i.e., the first water treatment plant intake. Algae from the river will also be analyzed under this monitoring program to address public concerns regarding the potential impact of treated water on the water quality of the Missouri River.

Issue 11

Comment. Monitoring reports should be provided to the public in a timely manner.

Response. Environmental monitoring reports are published annually, and subsequent reports will contain monitoring results for the treatment plant discharge in addition to results for other site discharges. To address the issue of timeliness, DOE also publishes quarterly data reports that are available to the public. Results of the NPDES permit monitoring will also be published monthly and will be available to the public upon request.

Issue 12

Comment. Will monitoring results be independently verified? Federal money should be used to support independent effluent monitoring to ensure the safety of citizens who receive their drinking water from the Missouri River.

Response. The Missouri DNR will independently monitor the treated water to confirm compliance with the NPDES permit. In addition, other interested parties could split samples of the treated water for independent analysis. Compliance with requirements of the NPDES permit will ensure that implementation of the proposed action does not impact the quality of water in the Missouri River. Therefore, citizens who receive their drinking water from the river will not be impacted by this action. Although no further definitive plans are yet in place for additional independent monitoring, DOE will discuss this issue with representatives of St. Charles County to determine if they are interested in expanding their current oversight program. These discussions will be held prior to the release of any treated water resulting from the proposed action. If further monitoring is added to the county's current water monitoring and oversight program, DOE will provide the additional funds.

Issue 13

Comment. Why are volatile organic compounds listed in the NPDES permit? Are they a concern for the water impounded at the chemical plant area?

Response. Volatile organic compounds have not been detected in the water impounded at the chemical plant area. These compounds are listed in the NPDES permit as part of a standard set of parameters that are generally included in state permits. Hence, if such compounds are detected in the future, a standard is in place to ensure their removal to safe levels. The proposed treatment system is capable of removing volatile organic compounds.

Issue 14

Comment. What treatment technologies are being proposed, and how were they chosen?

Response. Treatment technologies for the proposed action were selected on the basis of their applicability to site conditions and the contaminants of concern for the proposed action (see Appendix B of the EE/CA). These technologies were combined into specific treatment options, which were then evaluated on the basis of effectiveness and implementability; for options of similar effectiveness, the evaluation also considered relative costs. Based on a comparative evaluation of the treatment system options and consideration of potential influents to the treatment plant, a dual (hybrid) system -- consisting of vapor recompression/distillation in parallel with a physical/chemical treatment system -- was identified as the appropriate system for the proposed action (see Section C.4 of the EE/CA). This system is capable of removing a variety of contaminants and is responsive to influent variability.

Some subsurface material must be removed to construct the equalization basin and effluent ponds of the treatment system and to prepare the facility foundation. The material that will be removed from the location targeted for the treatment system (see Figure 8 of the EE/CA) includes old process and sanitary sewer pipes; about 3,000 m^3 (4,000 yd^3) of construction debris such as bricks, concrete, and timbers; and about 1,500 m^3 (2,000 yd^3) of soil contaminated with uranium-238 at levels of 15 to 20 pCi/g. This material will be placed in a staging area for controlled storage at the northern portion of the site, pending disposal decisions that are currently being developed for the project (see General Issue 20).

Issue 15

Comment. Has the proposed treatment approach been used elsewhere on a combination of contaminants similar to those present in the water impounded at the chemical plant area, or is this experimental technology? Will treatability tests be performed on the proposed technologies using actual water samples from the raffinate pits?

Response. The proposed treatment system is not experimental technology. It is composed of conventional unit operations that have been successful in both industrial and wastewater treatment applications. The physical/chemical processes of the proposed treatment system are similar to those included in the treatment plant designed for the quarry. The vapor recompression/distillation system has been widely used (e.g., for distillery operations and more recently in water treatment applications) with demonstrated effectiveness for influents both similar to and more concentrated than the water impounded at the chemical plant area. Bench-scale treatability tests using water from the raffinate pits will be conducted prior to final design and construction of the treatment plant to ensure that the system meets rigorous performance specifications.

Issue 16

Comment. The physical/chemical portion of the proposed treatment system is similar to that being constructed for the quarry. Have treatability tests been performed on the proposed technologies for the quarry system using water samples from the quarry pond? In particular, have the ion-exchange columns been tested?

Response. Bench-scale treatability testing for the quarry water treatment plant has been completed using samples from the quarry pond. Test results indicate that the contaminants are removed during the first-stage chemical addition/coagulation step to a greater degree than conservatively anticipated during conceptual design. Ion exchange is included in the quarry water treatment system as a "polishing" step, i.e., to further reduce residual levels of contaminants to meet stringent treatment goals. Based on the test results for the first-stage processes of the quarry system, it was determined that bench-scale testing of the ion-exchange unit was not needed because (1) treatment goals had been met with the first-stage processes and (2) ion exchange is a standard technology that has been widely used with demonstrated effectiveness in similar applications. Field-scale testing of all unit processes will be conducted prior to full-scale operation of the quarry system to ensure that the treatment system will meet established goals.

Issue 17

Comment. Reverse osmosis can be used to remove radioactive contaminants from water; was this process considered?

Response. Reverse osmosis was considered during the technology screening for the proposed treatment system (see Section B.1.6 of the EE/CA). However, the effectiveness of this technology for treating large volumes of water with variable contaminant conditions has not been widely demonstrated. Thus, treatment technologies with demonstrated effectiveness for conditions associated with the water impounded at the chemical plant area were considered to be more appropriate for the proposed action.

Issue 18

Comment. Were bioremediation technologies considered for this action, and will they be considered for future actions?

Response. Biological denitrification was considered for removing nitrates from the water impounded at the chemical plant area. However, the applicability of this bioremediation technology to the proposed action is constrained by several operating problems, including difficulty in start-up, control, and maintenance of treatment performance. In comparison, the vapor recompression/distillation process was determined to be more effective and reliable for a variety of potential influents (see Appendixes B and C of the EE/CA). Bioremediation technologies are also being considered for future actions at the Weldon Spring site.

Issue 19

Comment. Would treated water ever be mixed with untreated water prior to discharge, e.g., to meet permit requirements?

Response. Treated water will not be mixed with untreated water to meet NPDES permit requirements. However, because of the method by which DOE will ensure that only water meeting discharge limits is released from the treatment system, it is possible that treated water could be mixed with untreated water in certain situations. That is, if monitoring of water in the effluent ponds indicates that it does not meet discharge limits, this water will be returned to the equalization basin for additional treatment. If the equalization basin contains untreated water at that time, then the two types of water will be mixed at the front end of the treatment system. Following subsequent treatment, the effluent will be tested to ensure that discharge limits are met prior to its release.

Issue 20

Comment. What will happen to the waste generated by the treatment plant operation?

Response. The waste will be packaged in containers and placed in controlled storage on-site (see Chapter 7 of the EE/CA). The DOE is currently preparing a CERCLA remedial investigation/feasibility study (RI/FS) to evaluate alternatives for remediating the chemical plant area and disposing of waste generated by site cleanup activities. The RI/FS will include the analyses required by an environmental impact statement (EIS) for compliance with the National Environmental Policy Act (NEPA). Under this integrated CERCLA/NEPA approach, the environmental documentation package for the chemical plant area is termed the RI/FS-EIS. The final disposition of waste associated with the water treatment plant is being addressed in this RI/FS-EIS, which is currently in preparation. The RI/FS-EIS will be available for public review and comment in 1991.

Issue 21

Comment. Removal of water from the raffinate pits could result in increased releases of radon gas as the sludge is uncovered. Hence, a thorough radon monitoring program should be put in place, and site plans should include provisions for moving students and staff from Francis Howell High School during the action period.

Response. Because water is a very effective barrier to radon emissions, removing water from the raffinate pits could potentially result in increased releases of radon gas as the underlying sludge is uncovered. To minimize the possibility of radon releases, removing this water will be coordinated with plans for managing the sludge. This will ensure that workers and nearby individuals are not impacted by radon releases as a result of the proposed action.

There is no need to move the students and staff from Francis Howell High School for the duration of site cleanup. A thorough environmental monitoring program and contingency plans have been developed for the Weldon Spring project to ensure the protection of workers and the nearby public during site cleanup activities. State-of-the-art radon monitors were recently installed on-site and at the Francis Howell High School. Air will be monitored at both the site perimeter and the high school for the duration of site cleanup activities. The Francis Howell School District has received a grant from DOE to independently evaluate whether radon levels at the high school could increase as a result of site activities. The extensive monitoring program coupled with sound contingency planning will ensure that appropriate corrective actions are taken in the unlikely event of elevated radon concentrations at the high school; such actions will be taken in a timely fashion to prevent any adverse impacts to students and staff. Contingency plans will be reviewed with the high school before operations commence.

Issue 22

Comment. Precipitation falling on the raffinate pits will also become contaminated. Will this water be treated?

Response. Precipitation falling on the raffinate pits will be treated in the proposed water treatment plant. The design of the proposed plant has incorporated the estimated volume of precipitation falling into the four pits over the action period (see Table 8 of the EE/CA).

Issue 23

Comment. Decisions on how to safely handle both radioactively and chemically contaminated water should be made using approaches established under CERCLA or the Resource Conservation and Recovery Act (RCRA) instead of using the NPDES permit process under the Clean Water Act.

Response. The Weldon Spring site is included on EPA's National Priorities List, and the project is meeting the requirements of CERCLA as set forth by EPA. In addition, a wide range of federal, state, and DOE requirements were considered for developing appropriate treatment targets (see Appendix D of the EE/CA). If sludge resulting from the treatment process is determined to be hazardous waste as defined by RCRA, it will be managed in accordance with substantive RCRA requirements. The NPDES permit process is being followed because it is pertinent to the discharge of treated water to the Missouri River.

Issue 24

Comment. How does this water treatment action relate to future actions at the site, such as managing the raffinate pit sludge or contaminated groundwater?

Response. Removing the water from the raffinate pits will be coordinated with managing the raffinate pit sludge. The treatment plant will be available to treat contaminated water that could result from sludge management and from other cleanup activities at the site, e.g., equipment decontamination. Plans for managing the sludge, groundwater, and other media at the site are part of the cleanup decision that will be documented in the RI/FS-EIS that is currently being prepared.

Issue 25

Comment. No proven methods exist for cleaning up radioactively contaminated water and disposing of the resultant wastes. Specific examples include the Chernobyl nuclear power plant, radioactively contaminated submarines, nuclear weapons production sites, and the Three Mile Island nuclear power plant. Contaminated water from Three Mile Island was hauled from the site because it could not be released into the Susquehanna River. Since there is no proven history for managing such facilities, how can DOE expect the general public to believe that it can safely handle the contaminated water at the Weldon Spring site?

Response. The proposed water treatment plant utilizes conventional unit operations that have been successfully used elsewhere in similar applications. The water impounded at the chemical plant area can be effectively treated with proven technologies in a manner that will not adversely impact human health or the environment. The treated water will be released only after it has been tested to ensure that protective discharge limits are met. Hence, the proposed action constitutes a straightforward application of standard treatment processes, whereas cleanup of the area around the Chernobyl plant and other contaminated sites is considerably more complex. Treatment of contaminated water at Three Mile Island was an issue specific to the conditions at that facility. However, contaminated water was not hauled from the facility for treatment or disposal off-site.

The DOE is aware that its credibility on environmental issues has not been strong in the past, and the Department is working very hard to improve that situation. The project office is always willing to answer questions and discuss project cleanup activities with any interested member of the public.

WRITTEN COMMENTS AND RESPONSES

Comment letters on the EE/CA were received from John M. Gestrich, St. Louis, Missouri; William V. Thayer, Kirkwood, Missouri; and Mrs. Leo Drey, University City, Missouri. These letters were assigned an identification code according to date of receipt, and specific issues within each letter were identified with a number (e.g., A-1, A-2, and so forth). A copy of each letter is reproduced in this section, and the responses to identified comments are presented on opposite (and, if necessary, succeeding) pages. Responses are identified with the number corresponding to the respective comment.

John M. Gestrich
7530 Big Bend
St. Louis, MO 63119

August 16, 1990

Mr. Steve McCracken
Department of Energy
St. Charles Operations

Dear Steve:

In regards to the draining, filtering and disposal of the radio-active water from the Rafney Pits, I suggest the following.

A-1 1) Instead of releasing the water into the river, I think it should be evaporated with a solar evaporator.

A-2 2) With the potential of raydon gas being released, it is essential to move the Francis Howell students for the duration of the cleanup. The young people of the school should not have to be subjected to the radio-active contaminants, no matter how minescule the dose, that will be leaving the site.

Sincerely,

John Gestrich

JMG/ag

Response A-1

Several discharge options were considered, including impoundment in solar evaporation ponds (see Section 6.1 of the EE/CA). Because a balance exists between precipitation and evaporation in the Weldon Spring area, solar evaporation of the large volume of treated water resulting from the proposed action (more than 60 million gallons) is essentially infeasible. Also, land availability is insufficient to provide the required evaporation capacity. The success of evaporation is strongly dependent on meteorological conditions such as temperature, amount of cloud cover, and relative humidity. Environmental conditions in the area, including relatively cold winters and humid summers, would severely constrain the effectiveness and implementability of solar evaporation.

More important, the purpose of the proposed action is to remove contaminants from the water to produce a very high-quality effluent that can be released in accordance with the stringent discharge limits specified in the NPDES permit. Prior to any discharge, the water will be tested to ensure that it meets these limits, which were established on the basis of protecting human health and environment. Thus, there is no reason to store or evaporate the high-quality treated water.

Response A-2

Because water is a very effective barrier to radon emissions, removing water from the raffinate pits could potentially result in increased releases of radon gas as the underlying sludge is uncovered. To minimize the possibility of radon releases, removing this water will be coordinated with plans for managing the sludge. This will ensure that workers and nearby individuals are not impacted by radon releases as a result of the proposed action.

There is no need to move the students and staff from Francis Howell High School for the duration of site cleanup. A thorough environmental monitoring program and contingency plans have been developed for the Weldon Spring project to ensure the protection of workers and the nearby public during site cleanup activities. State-of-the-art radon monitors were recently installed on-site and at the Francis Howell High School. Air will be monitored at both the site perimeter and the high school for the duration of site cleanup activities. The extensive monitoring program coupled with sound contingency planning will ensure that appropriate corrective actions are taken in the unlikely event of increased radon concentrations at the high school; such actions will be taken in a timely fashion to prevent any adverse impacts to students and staff. Contingency plans will be reviewed with the high school before operations commence.

August 24, 1990

Mr. Stephen H. McCracken, Project Manager
U. S. D. O. E. Weldon Spring Site Remedial Action Project
7295 Highway 94 South
St. Charles, MO 63303
Phone: 441 8978

Dear Mr. McCracken:

I am pleased to have had a week to study the EE/CA since the Public Hearing. Thank you, your Public Hearing panel, Jim McKee, and Margaret M. MacDonell for the support of public information.

Written Public Comment about DOE's August 1990 EE/CA and related water treatment plans:

B-1 I commend the effort and valuable information given to human or public HEALTH IMPACTS in Section 6.2 pages 50 through 56 as well as other ENVIRONMENTAL IMPACTS. Ms. MacDonell tells me that it is possible to calculate the human impact on the health of a school bus load of children should it be unfortunate enough to overturn in the Southeast Drainage during the combined action of a treated water release and a heavy prolonged rain storm.

B-2 Section A.5 Table A.13 seems to indicate a mean of 682 pCi/L and an upper bound of 1,200 pCi/L for Total Uranium which is only a part of the actual radioactive isotopes present at the head of the Southeast Drainage. These numbers are higher than the means you gave at the Public Hearing (500 pCi/L). If all isotopes were counted, how much would it change the mean and upper bound?

B-3 The radioactive isotope activity UPPER BOUND for the combined action of a treated water release and a heavy prolonged rainfall is well over ten times the treated water release upper bound presented in the PUBLIC HEARING based on EE/CA data alone.

The same is true for the "RECREATIONAL" EXPOSURE SCENARIO ... INDIVIDUAL WALKER (FISH EATER) introduced on page 51, fish ingesting on page 53, should the individual like walking the Southeast Drainage during or just after a rainfall.

Response B-1

Potential impacts to human health that could result from the proposed action have been addressed for two primary scenarios (see Section 6.2 of the EE/CA). These scenarios were considered reasonable representations of land use and exposure conditions. The scenario discussed in this comment is relatively implausible because the Southeast Drainage is a small channel and the likelihood of a school bus overturning into it is very low. If such an accident were to occur, the potential health impacts associated with exposure to contaminants in the drainage could be estimated using reasonable assumptions for input parameters such as exposure point concentrations, exposure routes, and exposure duration. If such impacts were estimated for an overturned bus scenario, they would be much lower than the immediate health threats associated with the accident itself.

Response B-2

A range of values for uranium in water sampled at specific locations in the Southeast Drainage is presented in Table A.13 of the EE/CA. Two of these locations represent NPDES outfalls, i.e., points NP-0001 and NP-0005. The former receives discharge from the old sanitary and process sewer systems of the chemical plant; the latter receives surface runoff from the southeast portion of the site. The range presented in the EE/CA for uranium concentrations at these two points includes data from a number of years, extending through 1988. The information given at the public meeting reflected more recent data, i.e., from 1989. These recent data indicate that, following precipitation, uranium levels in water flowing into the Southeast Drainage at NPDES discharge points NP-0001 and NP-0005 range from 95 to 590 pCi/L and average 370 and 350 pCi/L, respectively.

Levels of total uranium and gross alpha activity are measured in water at a number of locations, including NP-0001 and NP-0005, as part of the site's current monitoring program. These measurements of gross alpha activity represent the concentrations of all alpha-emitting radionuclides. Because uranium and gross alpha levels measured at these locations are comparable, the gross alpha measurements are largely due to alpha particles emitted by uranium. That is, uranium is the primary alpha-emitting radionuclide present in the water, and other alpha-emitting radionuclides are present in relatively insignificant concentrations.

Response B-3

Data presented in Table A.13 of the EE/CA indicate that the maximum (i.e., upper bound) uranium concentration measured historically at points NP-0001 and NP-0005 is 1,200 pCi/L. These points represent storm-water flow and surface runoff from the southeast portion of the chemical plant area. More recent measurements (from 1989) indicate that uranium levels at these two points average about 370 and 350 pCi/L, respectively, and do not exceed 590 pCi/L. As the flow moves down the channel, these levels typically decrease to about 100 pCi/L. The concentration of uranium in the treated water resulting from the proposed action will not exceed 100 pCi/L.

The potential risks to an individual estimated to result from the proposed action are very low (see Section 6.2 of the EE/CA). These risks were calculated for two primary scenarios that were considered reasonable representations of land use and exposure conditions. The intake estimates were based on conservative exposure assumptions (e.g., drinking from the drainage during weekly walks for 22 weeks each year, continuing over a period of 10 years), so they provide realistic upper bounds of the risks that could result from the proposed action. Given the conservatism incorporated in the EE/CA analyses, varying the scenarios as suggested in this comment would not significantly alter the conclusions.

In certain instances, contaminant levels in water that currently flows in the Southeast Drainage may be higher following precipitation than the levels associated with the proposed action, e.g., depending on the location. For example, concentrations in water sampled at the head of the drainage, which represents storm-water contribution from the chemical plant area, may be higher than the concentrations in water sampled near the base of the drainage, which includes storm-water contribution from the relatively extensive, uncontaminated natural drainage area for that channel. Following remediation of the chemical plant area, the uranium levels in surface runoff from that area would be significantly reduced. Plans for this remediation will be documented in the RI/FS-EIS that will be available for public review and comment in 1991.

The risks estimated in the EE/CA are given as incremental risks, i.e., they represent potential risks associated solely with the proposed action. They do not include other potential risks such as those associated with exposure to background radiation or with routine ingestion of water that currently flows in the drainage from precipitation. For the hypothetical maximally exposed individual, the incremental risk of incurring a fatal cancer as a result of the proposed release of treated water to the Missouri River is less than 1/2,500,000 of the risk due to background radiation.

[Page intentionally left blank.]

B-3 What happens if we very the scenario? Is the individual habitually eating some of the algae covered watercress? Does the individual child have open cuts on bare feet? Could some H.S. students spend all their lunch periods on the upper end of the Southeast Drainage Creek and not question the action years later? Is the upper bound 100 times, 1000 times, ... the given SCENARIO? Where is it?

B-4 How does each scenario compare, if at all, with standard hospital diagnostic tests with respect to amounts of exposure given that the type of exposure is different? How can we understand the type and amount of exposure at the WSS in terms individual DNA damage?

B-5 Please amend Table 8, pages 67 though 69, by adding a treated water discharge with and without heavy rainfall sections for each period of years showing influent rate and volume for the Southeast Drainage. This Table type of missing information for this one path link in the chain extending to the Missouri River helps to confuse the issue about the EE/CA plan to dump in the river. Should we give more thought to the fact that you are dumping in the Southeast Drainage more than a mile from the river? What is the one to eight year flow expectation for this section of PUBLIC LAND open to any individual? What happens after eight years - low or no contamination in the creek and its springs?

B-6 Do you have a method we can use to arrange a PUBLIC MEETING for more accurate information related to the wisdom and the engineering evaluation of the Southeast Drainage part of the plan? **

B-7 The EPA tends to stay away from direct panel representation at public meetings related to the issues surrounding your work yet has a tremendous hand in many aspects of standards, control and evaluation. I and some others feel that this EE/CA, the Weldon Spring Quarry EE/CA (January 1989) as well as The Work Plan ... - Environmental Impact Statement... (August 1988) and the Radiological and Chemical Uptake By Edible Portions of Selected Biota at the Weldon Spring Site (August 1989) no longer constitute an Environmental Impact Statement. Consider the above SCENARIO blindfolded to the rainfall aspect.

B-8 The above documents do not state that food grown for human consumption is irrigated with contaminated water near the Quarry or that grown within several hundred yards of the sites is between chemical and radioactive contaminated ponds and lakes. In fact, one document states no human food is produced within several miles!

Response B-4

The annual radiation dose to the maximally exposed individual for the Southeast Drainage (recreational) scenario is estimated to be about 0.057 mrem/yr effective dose equivalent, and the dose to the maximally exposed individual resulting from routine exposures is estimated to be about 0.0007 mrem/yr (see Table 5 of the EE/CA). For comparison, the annual dose from background sources of radiation averages about 300 mrem/yr. The dose from medical diagnostic procedures ranges from a few millirem to 1,000 mrem or more, depending on the procedure; the dose from a typical chest X ray is about 10 mrem.

The probability of serious genetic effects from exposure to the radionuclides associated with the Weldon Spring site (i.e., primarily alpha emitters) is low relative to the probability of inducing a fatal cancer. The human body can absorb damage at the cellular level without demonstrating any health impairment; hence, expressing potential health risks from radiation exposure in terms of individual DNA damage is not as meaningful as estimating an increased probability of cancer induction and/or mortality. Therefore, the estimates of health impacts in the EE/CA for both individual and population receptors are expressed in terms of the potential induction of fatal cancer.

Response B-5

The information presented in Table 8 of the EE/CA details the estimated rates and volumes for the major influents to the treatment plant that were used as a preliminary design basis for the plant. Because information on discharge rates and flows in the Southeast Drainage is not appropriate for this table, it is presented elsewhere in the document (see Chapter 6 and Appendix A). Based on a number of considerations, discharge to the Southeast Drainage was determined to be the most appropriate means of releasing the treated water to the Missouri River (see Section 6.1.2 of the EE/CA).

As identified in the EE/CA, effluent will be released from the treatment plant at an annual average rate of less than 440 m^3/d (80 gpm); the batch discharge rate will average less than 880 m^3/d (160 gpm). During dry periods, the treated water will constitute essentially the entire flow within the Southeast Drainage (the continuous discharge from the sanitary system for the project office building averages a few gallons per minute); after a heavy rainfall, the average flow rates in the drainage could be much higher. Because the flow rate in the Southeast Drainage following a heavy storm could exceed several thousand gallons per minute, flow rates during the action period are expected to range from less than 160 gpm to several thousand (plus the relatively insignificant 160 gpm).

Following the action period, discharge from the water treatment plant will cease, and flow in the Southeast Drainage will essentially consist of surface runoff from the entire drainage area of the channel. The on-site areas that contribute to current contamination in storm water flowing in the drainage following precipitation will have been addressed pursuant to the cleanup decision for the chemical plant area; therefore, contaminant levels in the drainage flow following the action period will be low.

Response B-6

No additional public meetings are planned for the proposed action, e.g., to further discuss the release of treated water to the Missouri River via the Southeast Drainage. However, additional information on the action can be obtained by contacting DOE at the Weldon Spring site, and follow-up discussions with the project office are welcomed. Additional specific information on the proposed action will be developed as part of the detailed engineering design of the treatment system. Upon completion, this information will be made available to EPA Region VII, the state of Missouri, and interested members of the general public.

Response B-7

The activities and environmental compliance documents for the Weldon Spring project are developed in coordination with EPA Region VII and the state of Missouri. The documents listed in this comment are not intended to constitute an EIS. The DOE is currently preparing a comprehensive RI/FS for the chemical plant area, which will include plans for disposing of the wastes generated by site cleanup activities. The information in the RI/FS will be expanded to include that required in an EIS; the resultant integrated RI/FS-EIS will constitute both the CERCLA and NEPA documentation for this project.

Response B-8

Food crops grown for human consumption in nearby areas (e.g., land near the quarry) are not irrigated with contaminated water. In coordination with the Missouri Department of Conservation, DOE is developing a plan to test for radionuclides in nearby crops. The results of this testing program, which will be initiated next year, will be made available to the public upon completion.

[Page intentionally left blank.]

B-9 If the EPA took a direct (perhaps a third) panel status at these public hearings, we could have public discussion about higher standards for the Environmental Impact Statement. Perhaps ask why the EPA has not asked the FDA to sample the food crops as part of the normal FDA food testing program? What would they say about the risk to farmers? We feel that with the project broken into little parts and with integral federal agencies absent, the big picture is missing from all public discussion. How can we or the DOE bring about a better Environmental Impact Statement? When will the EPA take its place in the general public discussion of the EIS? Are some state agencies also missing? (Department of Health, Conservation, ...) How about a two or three evening public hearing with different agencies able to represent their relationship in your project?

End of My Written Public Comments

** If a meeting should occur:

I know that William H. Dieffenbach, Assistant Environmental Administrator, Missouri Department of Conservation has an interest in the testing of "clean" water in the Southeast Drainage. He has an interest in appropriate food testing. Perhaps he or a member of his staff would attend.

If this kind of information is at all related to the MDNR Discharge Permit(s), I ask that you include the MDNR to the same meeting.

I would appreciate having data and enlarged drawings of the Southeast Drainage, various scenarios calculated by the Argonne Laboratory group, and other documents sent to me several weeks or a month in advance.

Sincerely,

William V. Thayer

William V. Thayer
511 Goethe Ave.
Kirkwood, MO 63122
Phone: 314 821 5299

cc. MDNR, Missouri Department of Conservation, Coalition for the Environment, Post-Dispatch

Response B-9

The activities and environmental compliance documents for the Weldon Spring project are developed in coordination with EPA Region VII and the state of Missouri. The state agencies involved include the Department of Natural Resources, Department of Health, and Department of Conservation. The DOE is planning to collect and analyze samples of food crops in the area to ensure that no risks are incurred by potential consumers.

Cleanup of the Weldon Spring site consists of several components (see Figure 2 of the EE/CA). The overall remedial action for the project will be addressed in the RI/FS-EIS that is currently being prepared. Consistent with the project's environmental compliance process, various interim actions are being performed prior to completion of the RI/FS-EIS in order to mitigate actual or potential releases of radioactive or chemical contaminants to the environment. The proposed management of water impounded at the chemical plant area is one such action. Questions related to EPA and state involvement in this project should be directed to those agencies. The EPA has attended all public meetings for the project and has actively participated on a number of occasions. The EPA will be involved in discussions at the upcoming public meeting for the RI/FS-EIS.

Mrs. Leo Drey
515 West Point Avenue
University City, MO 63130

August 27, 1990

Testimony on the proposed discharge of Weldon Spring chemical plant area water into the Missouri River -- with some added comments. For the public meeting held by the U.S. Department of Energy, U.S. Environmental Protection Agency, and Missouri Department of Natural Resources in St. Charles on August 16, 1990.

I would like to start my testimony with a rather long introduction. I would like the record to show that if only a few St. Louisans happen to be here tonight, I believe it will be because you failed to notify the St. Louis public adequately. For example, you chose to mail a notification of this meeting to only two non-government, non-media members of the general public on the St. Louis side of the Missouri River. That is, of the
C-1 million and a half St. Louisans who get their drinking water downstream of the proposed discharge, you sent notification by mail only to two citizens: Roger Pryor, the Director of the Coalition for the Environment, who is here tonight and who of course has been interested in the Weldon Spring mess for years, and Jack Stein, the head of Anheuser-Busch's environmental engineering group.

At the very least I believe the 34 St. Louis citizens should have been notified who took the time to present oral testimony at the February 14 hearing last year here in St. Charles* about a similar proposal to "treat" and release an estimated three million gallons of radioactively contaminated water from the Weldon Spring Quarry into the Missouri River approximately 12 river miles upstream from our St. Louis drinking water intake pipes. Surely if those citizens were and are concerned about a proposal to dump three million gallons of treated water into the river 12 miles upstream, they would want to participate in the decisions about a proposal to dump an additional 57 million gallons 10 miles upstream.

C-2 As everyone in this room knows, only citizens who care a great deal about the environment take the time and expend the energy necessary, after a hard day's work, even to attend a hearing, let alone study and prepare testimony for one. I might add that although I was unable to attend the Quarry water hearing because of a back injury, I believe I, too, should have been sent notification of this hearing by mail, and a copy of the Engineering Evaluation. My guess is that there are few members of the general public in the audience here tonight who have expressed their concerns more consistently for more years than I have about the ultimate disposition of the Mallinckrodt nuclear weapons wastes on both the St. Louis and St. Charles sides of the Missouri River.

I also believe that the DOE, EPA, and our state's Department of Natural Resources should have made special efforts to notify members of the public about tonight's meeting since you have chosen to schedule it during one of the two months of the year when most Americans who are able to take
C-3 vacations do so. Add to that the realization that -- to quote from a recent letter I received from citizens who live near the DOE's Savannah River nuclear weapons plant, in South Carolina -- "it is difficult to arouse enthusiasm for a [hearing] process which appears to be window-

* a correction: the Feb. 14, 1989, DOE/MoDNR public information meeting was held in St.Louis County, not in St. Charles.

Response C-1

Notices of the public meeting held on August 16 at the Columns Banquet and Conference Center in St. Charles, Missouri, were placed in the *St. Charles Journal* on July 27 and again on August 3. In addition to these notices, several reports concerning the proposed action were presented in local newspapers (i.e., the *St. Charles Journal, St. Charles Post, St. Louis Post-Dispatch*, and *Riverfront Times*), and a number of related stories were broadcast on local radio and television stations. These project announcements and coverage by the local press provided sufficient advance notice of the public meeting to allow attendance by interested individuals from both St. Charles and St. Louis counties.

Response C-2

The public was notified of the meeting through two notices published in the *St. Charles Journal*; in addition to these notices, the proposed action was discussed in several articles in both St. Charles County and St. Louis County newspapers and in radio and television reports (see Response C-1). Certain members of the community, including those who chair local interest groups, were also notified of the meeting. Registered public attendance at the meeting numbered 52. Citizens interested in the DOE proposal to treat the water impounded at the chemical plant area and release the treated water to the Missouri River can review the EE/CA at one of the document repositories for the project, which are located at: the on-site reading room (St. Charles, Missouri), Francis Howell High School (St. Charles, Missouri), Memorial Arts Building at Lindenwood College (St. Charles, Missouri), and three branches of the St. Charles City/County Library -- the Kathryn M. Linneman Branch (St. Charles, Missouri), the Spencer Creek Branch (St. Peters, Missouri), and the Kisker Road Branch (St. Peters, Missouri). Copies of the document are also available from the Weldon Spring site project office upon request.

The DOE believes that the extensive notification of the public meeting was sufficient to allow for public awareness and input into the decision-making process for the proposed action. Therefore, DOE did not contact individual citizens who had previously provided comments on the quarry action. If they so desired, the 34 citizens who presented oral comments on the release of treated quarry water could have provided comments on this proposed action for the impounded water at the chemical plant area.

Response C-3

The DOE takes all public comments seriously and does not view this important input process as "window-dressing." The public was notified of the meeting through newspaper notices and articles, in addition to radio and television reports (see Response C-1). The meeting was scheduled to be held as soon as possible following completion of the EE/CA and preparation of the draft modification to the existing NPDES permit for the chemical plant area. No attempt was made to keep the attendance low by scheduling the meeting in August.

dressing...."

My testimony this evening is primarily a series of questions:

1. What evidence does the Department of Energy have that the two technologies proposed for the Weldon Spring combination of radioactive and hazardous wastes will actually remove the necessary percentage of those wastes to bring the discharge water into compliance with today's federal standards -- that is, with the contamination levels the federal government currently has decreed are acceptable for us to drink?

Have laboratory experiments been performed using your chosen technologies on actual Weldon Spring pit water samples? Is a pilot plant to be constructed and operated before a full-scale plant is built and operated? Where else in the United States have millions of gallons laced with our particular combination of toxic materials been similarly treated? As someone said earlier tonight, is this experimental technology?

C-4

As part of my oral testimony, in response to comments from the DOE panel, I said that three chemical engineers had told me that laboratory bench-scale testing is considered a standard operating procedure, and that pilot plants are also used widely -- even for more homogeneous, more predictable waste streams. Citizens concerned about the effectiveness of the proposed combination of treatment technologies for the Quarry water have been asking for over a year if tests are to be performed before a full-scale treatment plant is built, using water samples extracted from varying depths of the Quarry pond. At the 8/16 meeting I believe a member of the DOE panel responded that an actual Weldon Spring field sample had been run through a coagulator, but not through an ion exchange column. I expressed surprise when he described the latter technology as being used "only for backup," not as a primary treatment for uranium removal.

In response to various questions posed by citizens about the proposed technologies, DOE panelists answered that they were "very standard for removing uranium from water," and had been used in many places, including Colorado. I therefore cited an article entitled "Methods for Removing Uranium from Drinking Water," by Thomas Sorg, chief of the Inorganics and Particulates Control Branch, Drinking Water Research Division, U.S. EPA, from the American Water Works Ass'n Journal, July 1988. The article describes the status of research on the following water treatment technologies: coagulation-filtration, lime softening, ion exchange, activated alumina, granular activated carbon, and reverse osmosis. I read the following quotes for the record:

C-5

a. [from the abstract]: "The US Environmental Protection Agency has both sponsored several extramural research projects and conducted in-house research on uranium removal treatment. This article summarizes recent information on the effectiveness of various treatment methods to remove uranium from drinking water supplies. Because uranium is found in both surface water and groundwater, a variety of methods has been studied. Most of the information presented here, however, was developed from either laboratory or pilot-plant studies because only limited data exist on full-scale treatment systems." (emphases added)

b. [from the summary]: "Although laboratory and pilot-plant studies have evaluated a variety of methods for removing uranium, few full-scale systems have been built because a uranium regulation has not been

Response C-4

The proposed treatment system is not experimental technology; it is composed of conventional unit operations that have been used effectively in similar applications elsewhere. Consistent with DOE Order 5400.5, the proposed system consists of unit processes that represent the best available technology for treating liquids that contain radionuclides. The vapor recompression/distillation system has been widely used for waste streams that are both similar to and more concentrated than the water impounded at the chemical plant area; process flexibility and reliability have been demonstrated in a number of applications.

The physical/chemical processes of the proposed treatment system are similar to those included in the treatment plant designed for the quarry. Bench-scale treatability tests using samples from the quarry pond have been conducted as part of the detailed design for the quarry water treatment plant. Test results indicate that the treatment system effectively removes contaminants to levels at or below the established treatment goals. Similar bench-scale treatability tests using water from impoundments at the chemical plant area will be conducted prior to final design and construction of the proposed treatment plant to ensure that the system will meet stringent performance specifications. Only treated water that meets the limits established in the NPDES permit will be discharged from the site. If monitoring indicates that any limits are exceeded, the treated water will be returned to the treatment plant until all limits are met.

Response C-5

Ion exchange is one of many standard treatment technologies that are capable of removing uranium from water. This technology is a component of the treatment system planned for both the quarry and the chemical plant area. Ion exchange serves as a "polishing" step, i.e., the treatment processes that precede the ion-exchange unit will already have removed most of the contaminants. Ion exchange will then further remove residual uranium to produce an effluent of still higher quality.

Results of the treatability tests for the quarry system indicate that the physical/chemical processes preceding the ion-exchange unit remove uranium so effectively that levels are reduced to target levels prior to the polishing step. Hence, the ion-exchange unit did not require testing to ensure that the system will meet the treatment goals. As a component of the treatment system that will be constructed at the quarry, the ion-exchange unit will be field-tested to ensure that the full system operates effectively and efficiently at the larger scale. Water will not be discharged from the quarry water treatment plant to the Missouri River unless the levels established in the permit are met.

Research into improving and refining water treatment technologies is ongoing. The referenced article indicates that laboratory-, pilot-, and full-scale testing of the indicated methods for removing uranium from drinking water have been conducted at other locations. This research article and others indicate that these technologies can indeed effectively remove uranium from water.

established." (emphasis added)

C-6 2. Has anyone here at the Weldon Spring Site, in Jefferson City, or in Washington, D.C., re-assessed the current drinking water standards to determine to what extent they will have to be made more stringent in order to reflect the December 1989 report issued by the National Research Council? That is, now that an official updated assessment of the biological effects of low-level radiation on human health has indicated that the cancer effects have been underestimated by a factor of at least 3 or 4, will our nation's drinking water standards have to be updated, too? If so, is that apt to happen before or after the Weldon Spring "treated" water begins to be released into the river?

3. I am concerned about the proposal to release the water treatment plant effluent after treatment into the losing stream referred to as the Southeast Drainage, and then releasing it into the Missouri River. The Southeast stream is known to be extrememly contaminated because it "historically carried the majority of water which entered the chemical plant [uranium and thorium] process and sanitary sewer system." (Weldon Spring Site Draft Remedial Investigation Report [Draft RIR], Vol.I, Rev.A, p.5-24. August 1989).

C-7 For example, whereas DOE guidelines require that any site with soil containing concentrations of thorium-230 greater than 5 picocuries per gram must be remediated, "hot spots" have been found (or "estimated"?) in the Southeast creek sediment as high as 5610 pCi/g. (Weldon Spring Site Draft Baseline Risk Assessment, Rev.B, Table 6.3-1. October 1989) As an additional comparison, here in Missouri thorium-230 is found naturally in soil at 0.2 picocuries per gram!

a. Have any field studies been performed as yet to determine how much of the contamination already present in the Southeast stream bed may become resuspended when a water stream of the proposed water-treatment plant flow-rate flows through the stream sediment?

C-8 b. Has the Southeast Drainage easement been sampled as yet for chemical soil contamination or only for radioactive contamination (as per the Draft RIR, Vol.I, Rev.A, p. 5-23)? If elevated levels of any of the non-radioactive chemicals of concern have been found, is resuspension of any of those expected to occur in the treatment plant effluent on its way to the river?

C-9 c. What monitoring is planned, if any, at the confluence of the Southeast stream and the Missouri River?

C-10 4. Has the Department of Energy issued a Responsiveness Summary as yet on the questions and comments submitted a year ago as a part of the Quarry water public meeting process? If so, may I please have a copy?

C-11 5. Would it be technologically possible to build a large, lined evaporation pond within the Weldon Spring area to hold the water after it has been treated? Because the proposed full-scale water treatment plant may not work as well as predicted on Weldon Spring's particular combination of known and unknown materials, and because state-of-the-art monitoring technologies may not be adequate to test the multiple components in the treated water accurately, it seems to me that it would be safer for those of us who live downstream if the DOE were to retain the treated water for additional testing and, if needed, for additional filtering -- at least for

Response C-6

The BEIR V report presents a detailed description of current data on the health risk from exposure to low levels of ionizing radiation. Results of this study indicate that the health risk is about three times greater than that estimated in the BEIR III report. However, a number of limitations are associated with the data used to reach these conclusions, as noted in the BEIR V study. Estimates of the carcinogenic risks that may be associated with low doses of radiation were extrapolated from effects observed at doses greater than 10 rem delivered over a short period of time. A dose of 10 rem is greater than both DOE and NRC annual exposure limits for radiation workers, and it is much greater than DOE, NRC, and EPA exposure limits for the general public. Health hazards associated with chronic exposure to low levels of ionizing radiation have been studied at a number of locations -- including areas with high levels of background radiation, areas receiving fallout from nuclear weapons testing, and areas near nuclear installations. Results from these studies do not indicate an elevated level of cancer risk. Hence, it is not possible to draw definitive conclusions regarding cancer risks associated with chronic exposure to low levels of ionizing radiation.

The ALARA process is a major element of DOE's radiation protection program. Under this process, releases of radioactivity to the environment and related exposures are reduced to levels that are as low as reasonably achievable. The proposed action would not be affected if standards were lowered because the concentration of residual contaminants in the treated water at points of entry into public water supply systems would be far below applicable standards.

A drinking water standard for uranium has not yet been established. However, the uranium concentration in the Missouri River downstream of the discharge as a result of the proposed action will be more than 1,000 times lower than that occurring naturally in the river and more than 3,000 times lower than the lowest end of the concentration range being considered by EPA as a drinking water standard. Thus, the results of the BEIR V study do not affect the proposed action.

Response C-7

Numerous studies conducted by the Missouri DNR have established that the Southeast Drainage consists of four losing stream segments with associated downstream springs, and each segment is part of the recharge area for the next spring downstream. This indicates that flow in the channel is self-contained, i.e., water lost to the streambed stays within the drainage boundary. Residual levels of decay products of the uranium-238 and thorium-232 decay series are present in the sediments and soils of the Southeast Drainage as a result of deposition that occurred during the operational period of the chemical plant. Contaminant resuspension in the drainage has stabilized over time, and current concentrations in water that flows in the drainage following precipitation are generally low. The release of treated water into the Southeast Drainage is not expected to result in significant resuspension of contaminant residuals in the drainage at the batch discharge rate.

To address the issue of potential resuspension, tests are being conducted in the Southeast Drainage in coordination with the Missouri DNR. For these tests, water is released from a fire

hydrant at the top of the drainage at a number of flow rates, including the discharge rate planned for the proposed action, and water samples are collected at several locations within the drainage to evaluate the degree to which contaminants are resuspended. Test results will be made available to EPA Region VII, Missouri state agencies, and the public following sample analyses. Based on previous studies, no significant resuspension is expected; however, DOE will reevaluate the discharge plan if the results indicate that significant resuspension could occur. For example, if potential resuspension were identified, the discharge could be piped to a point in the drainage beyond the area of significant impact or it could be piped along the haul road between the chemical plant area and the quarry (as described for Option 4 in Section 6.1 of the EE/CA).

Response C-8

Soil and sediment in the Southeast Drainage have been sampled for metals and nitroaromatic compounds as well as radionuclides. Measured radionuclide concentrations are given in Table A.14 of the EE/CA. The table as presented in the EE/CA contains some errors; the corrected table is provided on the following page. In addition, water in the drainage has been sampled for radionuclides, nitrates, sulfates, and nitroaromatic compounds to assess potential contaminant resuspension and transport. Studies are currently under way to determine whether contaminants could be resuspended as a result of the proposed action (see also Response C-7).

Response C-9

As part of the NPDES monitoring program for this action, water will be sampled from the Southeast Drainage at its confluence with the Missouri River. Additional monitoring in both the drainage and the river is being conducted as part of the project's extensive environmental monitoring program (see Response to General Issue 10).

Response C-10

The responsiveness summary for the quarry water treatment plant EE/CA was issued in June 1989. This report is available at the Weldon Spring site and can be read at any of the document repositories for the project (see Response C-2).

Response C-11

The purpose of the proposed action is to remove contaminants from the water impounded at the chemical plant area to produce a high-quality effluent. Conventional treatment technologies are currently available to remove these contaminants. Prior to any release, the water will be treated to meet the stringent water quality levels that are specified in the NPDES permit. In addition, standard monitoring procedures will be used to ensure that the permit requirements are met. If monitoring indicates that the water does not meet discharge limits, the water will be returned to the equalization basin for a second pass through the treatment system. Hence, there is no reason to store the treated water on-site.

TABLE A.14 Radioactive Soil Contamination in the Southeast Drainage

		Concentration[a] (pCi/g)	
Sample Type	Radionuclide	Army Reserve Training Area	Weldon Spring Wildlife Area
Surface soil	Radium-226	0.76-8.36	2.57-110
	Thorium-230	-	5,610; 10,100[b]
	Thorium-232	0.43-2.69	<0.51-240
	Uranium-238	<0.76-42.0	28.6-720
Borehole	Radium-226	2.04-210	2.82-130
	Thorium-230	11.5; 4.15[c]	-
	Thorium-232	0.88-69.1	0.51-150
	Uranium-238	1.52-1,010	9.58-810

[a] A hyphen indicates that data are not available; a less than symbol (<) indicates that the measurement was less than the detection limit for that parameter.

[b] Average and maximum values, respectively.

[c] Values for 0.15- to 0.3-m (0.5- to 1-ft) and 0.3- to 0.46-m (1- to 1.5-ft) depths, respectively.

Sources: Data from Boerner et al. (1986) and Deming et al. (1986).

a few years -- rather than releasing it into the river. Now that the Department of Energy is finally beginning to study ways to clean up
C-11 thousands of sites nationwide which are contaminated with nuclear weapons waste, we can only hope that new and improved monitoring and treatment technologies will become available in the near future.

6. I would appreciate a clarification of the claim made here tonight that there has been no uptake of uranium detected in any of the fish tested from the Weldon Spring Site. Not even in the bones, where uranium is known to concentrate? Not even in the fish caught in the highly-contaminated Femme Osage Slough next to the Quarry?

C-12 According to a report published in 1982 by NLO, Inc., elevated levels of radioactivity (uranium, thorium, lead, and radium) were indeed found in the bone portion of slough fish, such as in carp. (Weldon Spring Storage Site Environmental Monitoring Report for 1979 and 1980. NLCO-1176, Table 14).

7. What is the contingency plan in the event the treated water becomes re-contaminated as it flows through the Southeast Drainage creek? How will anyone know if it is contaminated? (At first at the 8/16 meeting when I
C-13 asked how often the Southeast creek water is monitored where it flows into the Missouri River, I was told it is monitored there annually. But then after I asked if these data appear in the annual monitoring report, it was discovered that such monitoring is not currently performed.)

8. What is the current plan for storing the bulk wastes and
C-14 contaminated sediment to be exhumed from the four raffinate pits -- that is, for the 26 acres of industrial sludge?

9. Subsequent to the 8/16 meeting I became increasingly concerned about the possibility that state-of-the-art monitoring may not be either technologically sophisticated or "cost-effective" enough to provide assurance that the treated waters will meet drinking water standards before
C-15 being released into the environment beyond the Weldon Spring Site. What monitoring technologies and laboratories have been chosen? What tests have been performed using the chosen monitors? What quality control programs are proposed for the DOE or EPA's surveillance of the contracted laboratory?

I am particularly concerned about the availability of a technology for the testing of alpha emitters in water. Because the alpha radiation in the Weldon Spring pits and ponds is shielded by water -- and because alpha particles cannot move through aqueous solutions -- the <u>accurate</u> detection and measurement of the alpha particles in the Weldon Spring water treatment
C-16 plant effluent will be extremely problematic, if not impossible. Although alpha particles cannot penetrate through water, when they are ingested (e.g., in drinking water) or inhaled, their potential health impact, as currently assessed by the Nuclear Regulatory Commission, is twenty times more damaging than beta particles or gamma rays.

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Response C-12

The statement made at the public meeting addressed the issue of increased bioaccumulation, not biouptake. As stated at the meeting, there has been no evidence of increased uranium bioaccumulation in fish that have been tested as part of the project's sampling program.. To understand this statement, it is important to understand the distinction between biouptake and bioaccumulation. Biouptake is the uptake of a contaminant from an environmental medium by an organism in contact with that medium. Bioaccumulation is the accumulation of a contaminant in that organism at a level statistically higher than the level in the environmental medium to which it has been exposed. For example, if the concentration of radium in soil were 1 pCi/g and the concentration of radium in a Brazil nut on a tree grown in that soil were 1,000 pCi/g, bioaccumulation would have occurred.

Results of fish studies conducted by the project to date indicate that uranium has been taken up by fish, as correctly identified in this comment, but not at levels higher than expected from typical bioaccumulation for uranium in fish, as stated at the meeting. That is, the concentrations of uranium in fish samples collected from lakes impacted by the Weldon Spring site are higher than the concentrations measured in fish from similar bodies of water that contain background levels of uranium. However, the bioaccumulation factor -- i.e., the ratio of the uranium concentration in the fish (in pCi/g) to the uranium concentration in the water (in pCi/L) -- is the same for both the fish in lakes impacted by the site and the fish in lakes that have not been impacted. Hence, bioaccumulation has occurred at expected levels, not at levels increased above those typical for the bioaccumulation of uranium in fish. The potential health effect from consuming fish impacted by the Weldon Spring site is very low. This issue is being addressed in greater detail in the RI/FS-EIS currently in preparation.

Response C-13

Flow studies are being conducted in the Southeast Drainage to address the issue of potential contaminant resuspension; results of these studies will be made available upon completion (see Response C-7). If results indicate that significant resuspension could occur, a contingency plan will be implemented, e.g., optimizing the discharge flow rate or using a pipe for at least part of the distance in order to minimize potential health impacts.

Quarterly sampling of the water in the Missouri River at the location of the Southeast Drainage was recently added to the site's extensive environmental monitoring program. In addition, water flowing within the drainage is monitored quarterly for radioactive contaminants. To assess potential impacts associated with effluent release, water will also be monitored in the Southeast Drainage at its confluence with the Missouri River. As stated in the permit, this monitoring will be conducted for the same parameters and at the same frequency as the monitoring for effluent prior to its release.

Response C-14

Plans for managing the quarry bulk wastes and raffinate pit sludge are part of the cleanup decision for the chemical plant area and will be documented in the RI/FS-EIS that is currently being prepared. The RI/FS-EIS will be available for public review and comment in 1991. Plans for managing the bulk wastes and raffinate pit sludge will be finalized following public review and comment on the RI/FS-EIS.

Response C-15

Effluent from the water treatment plant will be monitored with advanced technology, as approved by EPA and required for NPDES monitoring programs. The sensitivity of the advanced instrumentation is such that the monitored parameters can be measured at levels lower than those specified in the NPDES permit. This will ensure appropriate detection for permit compliance. Cost was not considered in identifying the methodology for this monitoring effort because the EPA has standardized the procedures for NPDES monitoring programs. The technology that will be used to monitor the treated water from the water treatment plant has been tested on numerous occasions, and the EPA has approved this technology for the proposed action (see also Response C-16).

Samples of the treated water will be analyzed at laboratories that operate under EPA's Contract Laboratory Program (CLP). The CLP laboratories routinely undergo rigorous independent evaluations to ensure appropriate quality assurance and quality control. These evaluations address such issues as equipment calibration; sample recovery; and blind, duplicate, blank, and spike sample analyses. In addition, laboratories under contract to DOE for this project are required to submit all analytical procedures to site personnel for review and approval prior to conducting any analyses. At the site, sample collection procedures are reviewed and approved by managers of the quality assurance department and other departments. The quality assurance department also conducts periodic audits of contract laboratories to ensure that approved procedures are being followed. Analytical results are subsequently verified and validated by site personnel.

An effective environmental monitoring program has been in place at the Weldon Spring site for many years. Standard analytical procedures have been used for water analyses under this program, with good results for both radiological and chemical parameters. As part of the site's quality assurance program, the Missouri DNR routinely splits samples for independent analysis at the state's laboratory, and other parties are welcome to participate in the split-sampling program. For example, samples from the quarry monitoring wells have been shared with various groups for independent analysis over the last several years, and results have consistently been comparable.

Response C-16

Standard radiochemical procedures have been established in a laboratory manual prepared by the EPA for use in the analysis of radioactivity in drinking water (see *Prescribed Procedures for Measurement of Radioactivity in Drinking Water*, EPA/600/4-80-032, August 1980). The manual includes specific procedures for analyzing water samples for radionuclides that are listed

in the NPDES permit for the proposed action. These procedures possess the sensitivity necessary to determine compliance with the concentration limits specified in the permit. The method capabilities and minimum detection limits have been determined by (1) extensive replicate testing, (2) an internal quality assurance program, and (3) collaborative test studies designed specifically for these radionuclides (see also Response C-15).

As noted in this comment, the potential health impact of alpha particles is greater than that of beta particles and gamma rays for the same internal radiation dose (in rad), e.g., from ingestion or inhalation. This impact was incorporated into the risk analysis presented in the EE/CA. The biological significance of various forms of radiation is expressed by the dose equivalent (in rem), which is obtained by multiplying the radiation dose (in rad) by a quality factor. For radiation dose calculations in the EE/CA, a quality factor of 1 was used for beta particles and gamma rays, and a quality factor of 20 was used for alpha particles.